

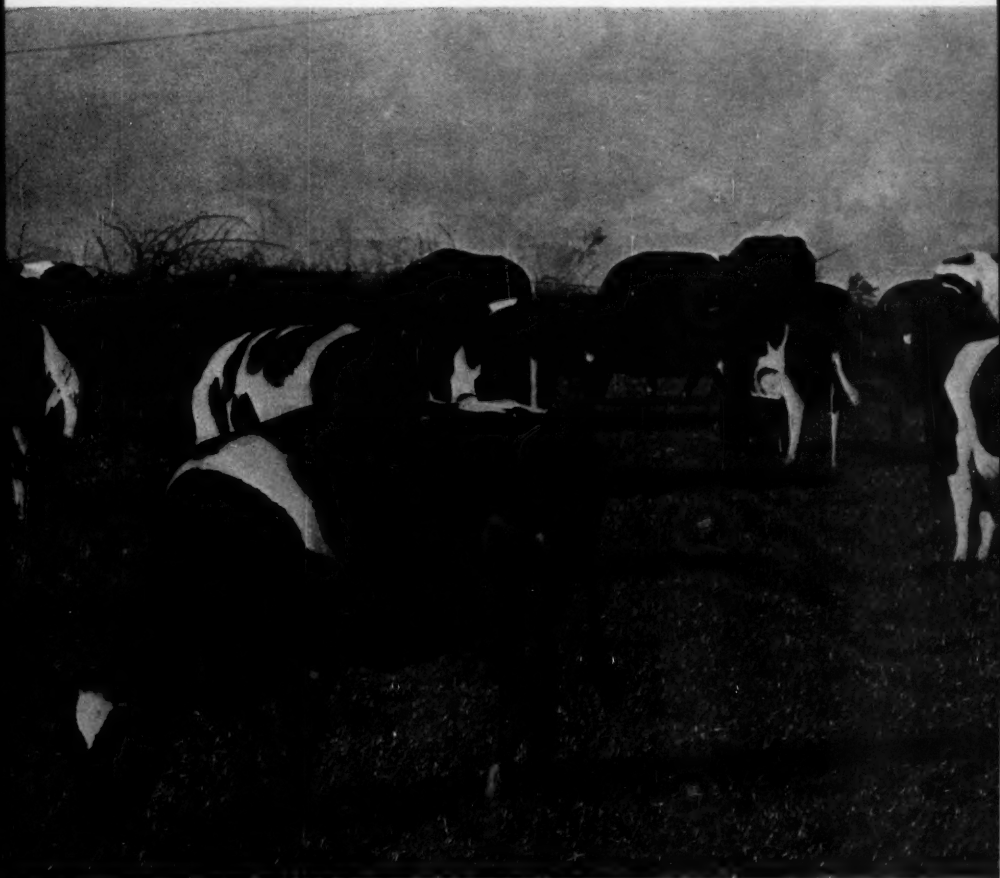
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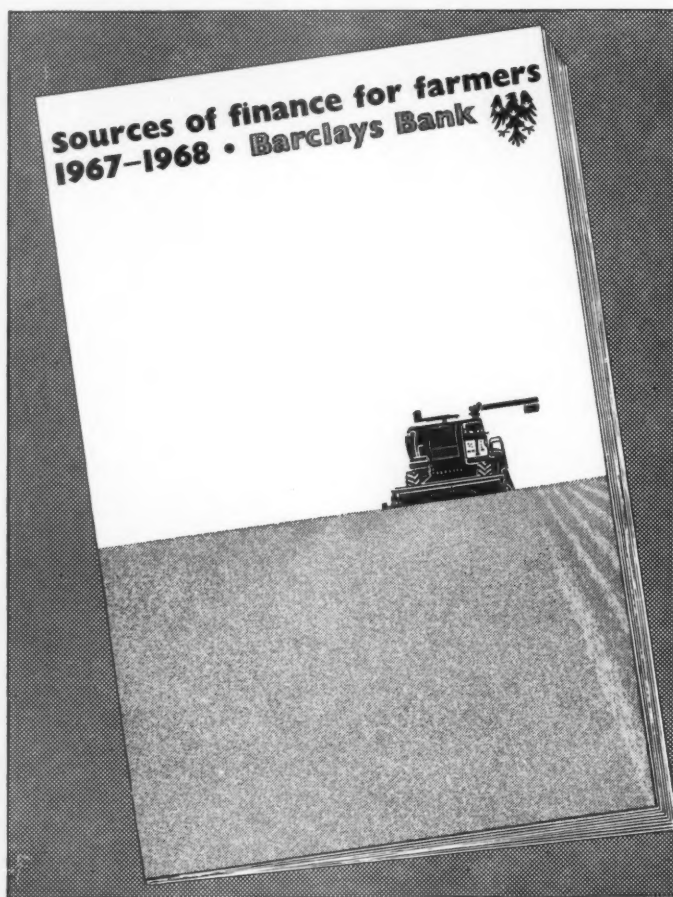
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The Royal International Dairy Show,
21st—25th October, 1967



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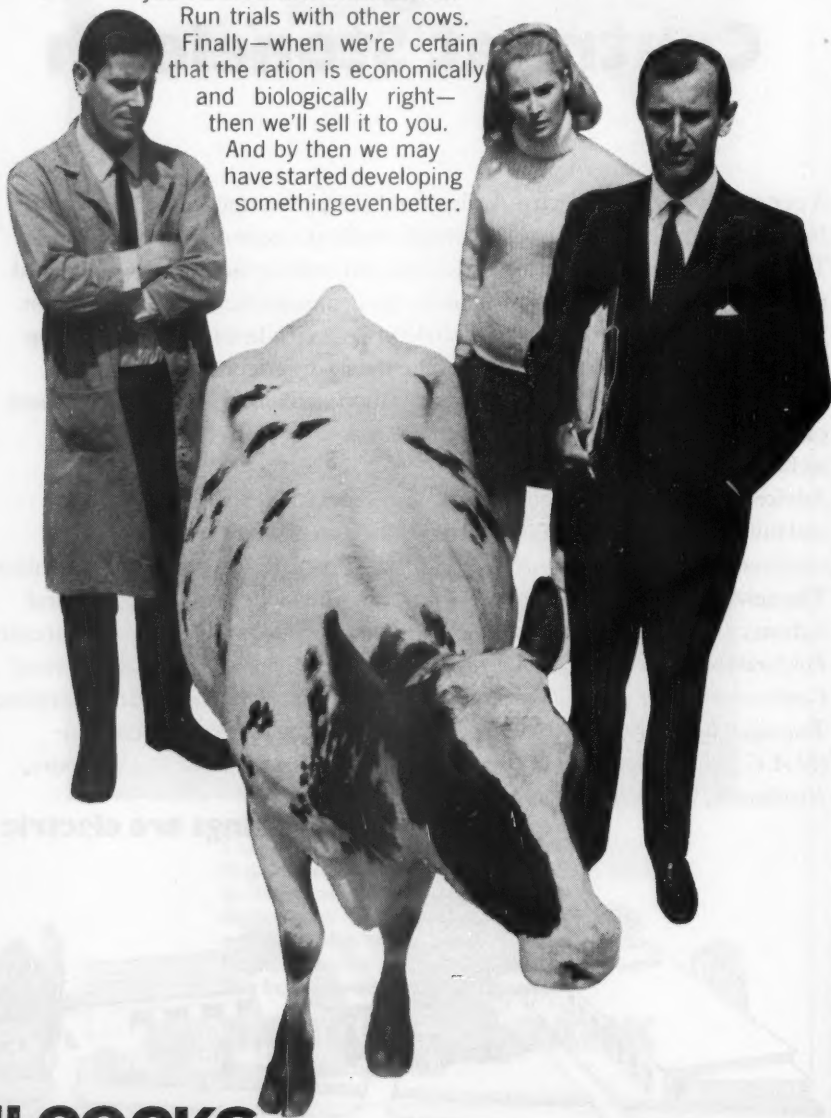
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Agriculture

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Frost

W. H. Hogg

THE effects of frost on almost all types of farming may be both extensive and profound; these may be direct or indirect, beneficial or harmful. On the one hand frost may contribute much to the formation of a seedbed; on the other, it may well determine the limits within which a given crop can be grown commercially. Certainly in cool temperate latitudes, where frost may be expected regularly but is not necessarily continuous for long periods, it plays a large part in determining land use, particularly where the growth of fruit and vegetables is not ruled out for other reasons. The tenth in the Aberystwyth series of symposia in agricultural meteorology was held this year at the Welsh Plant Breeding Station. The title was 'Frost' and the speakers covered many aspects of agriculture, horticulture, forestry, meteorology, pedology and economics. The convenor opened the meeting with a survey of the problems caused by frost and suggested that meteorological data should be more closely related to biological thresholds, and that cost-benefit analyses are needed in relation to frost protection devices.

Effects of frost

One of the major difficulties is that decision-making may be at the mercy of both individual management and the weather, a daunting combination when one considers the difficulties in forecasting a frost which is likely to be of major economic importance on a given farm. Frost is a word which can be used to describe a number of freezing phenomena and many workers are interested in particular aspects of frost. For example, much can be learned from a study of permafrost features in northern latitudes where there are many ways in which ice can form within the soil, depending on the depth below the surface, soil texture, the amount of available water, the speed of freezing and the time for which low temperatures are sustained. Although the soil in the British Isles is no longer subject to the formation of con-

siderable quantities of ice, the past has left its mark on our soils. For example, the strong angular blocky structure found in the subsoil of many fine-textured soils is considered to be a relic of the formation of lattice ice which has enclosed sub-cuboidal units of frozen soil, varying in dimension from one to ten cm. Whatever may have happened in the past, at present our lowland areas are rarely, if ever, frozen to a depth of 2 ft but frost at 2 in. may be prolonged in dull winters of only moderate severity, though many winters pass without frost at this depth. In the uplands the data we have suggests a maximum possible frost penetration of some 5 to 6 ft in an average winter, with a possibility of 8 ft or more in a very cold winter, after which a sub-surface freezing layer might well survive until May or later.

Plant survival

From the standpoint of plant survival during frost, it is the events which occur within the plants themselves which are decisive. Whether or not the plant is damaged depends on a number of factors including the location of ice formation within the plant. For instance, it is generally believed that any ice formation within the confines of the outer layer of the cytoplasm is fatal to the cell, as the ice usually spreads through the cytoplasm destroying all structure so that, after thawing, only a biochemical 'soup' remains. Among the physical factors which favour the survival of hardy plants during frost are the rates of cooling and thawing—a slow freeze and a slow thaw are less damaging than more rapid temperature changes. Also, snow cover and a lack of wind are advantageous in preventing mechanical damage from flexing in the frozen state.

Plant breeders seeking to improve the winter hardiness of field crops are principally concerned with the genetically-controlled ability of some varieties to withstand the effects of freezing. Of the cereals economically important in the British Isles, wheat is sufficiently hardy and frost resistance is not a major problem. Oats and barley, however, were traditionally spring sown; breeding for autumn sowing is comparatively recent and the problem of winter hardiness arises, more in oats than in barley. Because of the unpredictability of the weather, field observations must be combined with artificial tests and recent work has made use of soil boxes of expanded polystyrene, portable refrigerators lowered on to test plots, and the cooling of parts of hardened plants in waxed paper bags. An entirely different method for testing hardiness in the laboratory has been used for raspberries. This gives a hardiness rating from a comparison of the electrical impedance measured before and after a cold treatment on a 6-in. portion of raspberry cane.

Frost and livestock

Frost is not usually responsible for disorders in mature livestock, although in combination with wind it may put animals under stress so that they become more readily susceptible to disease. Recent work suggests that the shedding by sheep of their permanent incisor teeth may be related to the incidence of severe frost. There is a suggestive similarity between the observed erosion of incisor alveolar bone and the damage caused by frostbite to the bones of the fingers, for example. This damage may be due to the feeding of frozen turnips to sheep at a time when the alveolar bone is particularly susceptible to chilling and experiments are being carried out to test this hypothesis.

Reducing damage

A knowledge or, at least, an estimate of frost frequency, particularly in spring, can be important in relation to both horticulture and forestry. In horticulture this enables suitable sites to be selected for orchards and rational judgments to be made on the adequacy of existing water supplies for use when sprinkling to prevent frost damage. Although there are a number of ways in which it is theoretically possible to prevent or reduce frost damage, only two, heating and sprinkling, are of importance in this country. There are still many difficulties in the prevention of damage. For example, the temperature at which 50 per cent damage occurs on strawberry flowers and fruits varies from about 22°F in the compact bud-cluster to about 28°F at petal-fall, a difference which must greatly affect decisions as to the use of sprinkling or heating on individual nights. Also, the problem is complicated by the fact that yields of some fruits are not reduced by all frosts; they may even be increased on occasion.

For north temperate forest trees there is experimental evidence that the critical value for frost damage in the vegetative period is about -4°C (25°F) but there are other variables which may affect this, such as the duration of exposure, time of year, and the age and previous history of the plant. In Thetford Chase there have been unexpectedly high losses of Corsican pine plants in new plantations. These losses are greater than during earlier plantings some 40-50 years ago, although there do not appear to be any significant temperature differences between the two periods in winter and spring. The differences probably arise from local effects brought about by the presence of the trees and by differences in ground cover and topography.

Decisions

The economics of frost are in the main concerned with decisions about the use of resources, but occasionally it may call for decisions affecting distribution, for example the transport of potatoes. Long-term decisions are mainly related to the selection of land which is suitable for a particular enterprise, i.e., land with an acceptable frost risk. Short-term decisions include the selection of rotation or variety, which may sometimes be superseded within a year, and decisions on the use of frost protection on a particular occasion. In horticulture, a new factor has appeared which may affect the making of decisions, the requirement of satisfactory market outlets which may lead to close links between the grower and the user. Continuity of supply is an important feature in maintaining these contacts and in order to safeguard this, growers may need to diversify their sites, to co-operate with others to supply an outlet or to undertake frost protection measures which might otherwise be ruled out.

The value of this symposium was much enhanced by the fact that the contributions were available in bound form during the meeting. This forms a most useful reference and copies can be obtained from the convenor, Mr. J. A. Taylor, Department of Geography and Anthropology, University College of Wales, Llandinam Buildings, Penglais, Aberystwyth (10s. plus postage).

The author of this article, **W. H. Hogg, M.Sc.**, is a Principal Scientific Officer of the Meteorological Office. He is attached to the Ministry's Office at Bristol, covering the South-Western and West Midland Regions and Wales.



Avoiding Potato Losses— Some simple guides

G. M. Jones

POTATOES are not eggs—but should be treated as such. However much we may agree or disagree with this statement, the facts revealed from various investigations confirm that far too many potatoes which could usefully contribute to the farm income, are being unnecessarily lost through damage. Damaged potatoes are not good business. Half a ton per acre wasted means a loss of approximately £140 per 20 acres grown—equivalent to a substantial proportion of the depreciation rate on a £1,200 potato harvester.

Evidence indicates that during recent years, since the increased mechanization of the potato harvest, there has been a substantial increase in the total amount of damaged potatoes. However, with an ever dwindling labour force, increased mechanization must continue. A clear understanding of a few simple principles in the handling and storage of the crop can be effective weapons in reducing losses. Three aspects that seem to be paramount are:

1. Reducing physical damage at harvest time.
2. Ensuring that only sound potatoes are stored.
3. Ensuring storage conditions at harvest time which will inhibit disease development.

Physical damage

Weather and soil conditions during harvest time have a direct bearing on the amount of damage caused by most lifting techniques dependant on machinery. A light soil under dry conditions can result in considerable bruising, whereas a medium or heavy soil under damp conditions can reduce the actual bruising effect but result in far too much soil finding its way into the store, giving rise to heating and pockets of subsequent rots. A machine should therefore be adjusted as near as possible within its potential to cater for these varying working conditions.

The aim should always be the minimum agitation of the crop being lifted, and to free most of the soil from the tubers. The liberal use of rubber or similar material to cover sharp edges, rollers and tines, does help to reduce damage but the setting of the machine is of immense importance. The point of the lifting share should be set exactly beneath the centre of the row and just deep enough to avoid slicing the tubers. Too deep a setting of the share can result in wheel slip.

When operating spinners, the impact of the tines on the tuber is the governing factor, and the aim should be the lowest p.t.o. speed with as high a forward tractor speed consistent with efficient lifting.

Unnecessary bruising can be avoided by reducing to a minimum the distance a tuber has to travel. Wherever possible, a tuber should not drop much more than 18 in. from any discharge system, whether in the field or store. It is always good practice to cushion the fall by using straw bales.

One must not judge the effectiveness or otherwise of a machine in avoiding damage without also remembering the human element involved in harvesting. Standing unnecessarily on loads and clamps can cause damage, and careless handling of bagged potatoes is another unforgivable crime, without mentioning the use of sharp tools at the clamp face during the winter period.

It is encouraging to note that in the design of modern harvesters, performance and work output have not been the only criteria, and over the years progress has been made in reducing mechanical damage. Economically there might be a future case for concentrating more on potato varieties with tougher skins, to fully utilize costly machinery and scarce labour, rather than selecting for marginal yield increases.

Store only sound potatoes

At harvest times, speed of operations can often be paramount in the farmer's mind without sufficient attention being paid to the condition of what is being harvested. The selective advantages of the human eye cannot be over emphasized when hand-picking off either the field or a machine riddle. Badly damaged or diseased tubers should be discarded at this stage because if stored they can act as focal points for further deterioration.

However, any action to discard damaged potatoes at harvest time is a case of closing the stable door after the horse has bolted. The prime aim should be to grow a crop of sound tubers. With this in mind there are many steps which can be undertaken during the growing stages e.g., (a) providing a good ridge to avoid green potatoes, (b) on heavier soils, adapting techniques to eliminate clod formation and the subsequent hazards and stresses which can arise at harvest time, (c) certain varieties are very prone to attacks of blight and spraying combined with burning-off of the tops is an effective means of reducing losses. It is often sounder practice to burn off tops rather than apply a late blight spraying which can only further preserve the green tops as a source of blight spores which can be washed on to the tubers. At least 14 days should elapse between burning-off tops and lifting. If the tops are not burnt off, then they should be as nearly dead as possible before lifting, especially with the varieties that are more susceptible to blight.

Maincrop potatoes should only be lifted when fully matured. This enables the well developed corky tissue to protect the delicate inner flesh and greatly reduce the risk of damage. Immature tubers are also liable to heat in the store. Favourable dry weather during early to mid-September is always a temptation to commence lifting too early, however, the degree of maturity of the crop should always be the determining factor.

Having ensured a sample of sound tubers at lifting time, the grower is still left to the mercy of the autumn weather as far as further damage is concerned. There is little he can do about this other than assess his resources of labour, machinery and acreages involved, before deciding to push ahead at all costs, or fitting in his programme to take advantage of the most favourable soil and weather conditions. This is very much a personal decision.

Striving to grow and harvest sound tubers can be rewarding and has a far-reaching influence on the saleable tonnage. A 14-ton per acre crop with two or three tons waste or damaged tubers to be discarded can be less

profitable than an 11-ton per acre crop with hardly any waste, especially when labour, land and building costs are taken into consideration to accommodate the high wastage rates. However, with modern techniques and knowledge there is no reason why yields of sound potatoes of 14 tons per acre and even more cannot be achieved on the better soils.

Prepare at harvest time to reduce storage losses

Most losses in store, excluding those that arise as a direct result of frost damage, are of a disease nature arising from either fungal or bacterial infections. The aim at harvest time should be to create conditions unfavourable for these troubles to develop. Mention has been made of the importance of avoiding excess soil in the clamp, discarding diseased and badly damaged tubers, and extra care in handling the crop to reduce serious bruising.

However, one must accept that under the most perfect routines a percentage of damaged potatoes do find their way into the store. Often the damage is only very slight and hardly visible to the naked eye, but all the same sufficient to allow entry of diseases unless some action is taken to heal these wounds. Fortunately, nature has built into the potato a mechanism for dealing with such injuries by quickly forming scar tissue to protect the damaged areas. It is therefore important that the farmer should understand how to assist in this process by providing the right conditions for wounds to heal.

During the first 14 days the store should 'sweat' and temperature allowed to increase to about 60°–65°F. In some store houses this means restricting ventilation for a while. However, once the wounds have healed then the clamp temperature should be reduced to somewhere in the region of 45°F, either by forced ventilation in deep storage clamps or by opening up natural building ventilation systems with shallower storage depths. Floor ducts and vents can prove to be invaluable assets in controlling storage temperatures. It is often found that in most 'open barn' type buildings, there is sufficient natural ventilation within and above the crop. Sometimes, however, effective ventilation can be impaired by soil 'coning' within the clamp, due to failure in moving the elevators sufficiently often during the filling operations.

When cooled to a safe storage temperature the potatoes should be covered with some 12–18 in. of loose straw which absorbs moisture arising from the bulk, prevents further greening of tubers and reduces the risks from frost.

The principle of increasing temperature to heal wounds is often overlooked during the winter months when stores are being re-opened and tubers again damaged on passing over riddles. This is particularly important when seed potatoes are being saved from ware stocks, as such wounds unless healed can further facilitate the spread of gangrene disease, losses from which, during recent years, seem to be reaching alarming proportions.

Agriculture can well be proud of its productivity record during recent years, especially with the potato crop where tremendous mechanical and technical progress has been made. However, there yet seems much to be gained by a wider application and better understanding of the basic principles involved in reducing losses and their intelligent interpretation in growing and storing the crop.

This article has been contributed by G. M. Jones, B.Sc.(Hons.) (University of Wales), who is Senior District Agricultural Adviser for the N.A.A.S. in S.W. Lancashire. Born in Caernarvonshire of a hill farming family he has always been interested in farming. Since moving to Lancashire three years ago he has been involved in investigating the potential use of potato root eelworm resistant varieties in the area.

Break Crops— Oilseed Rape



E. S. Bunting

The acreage of oilseed rape grown in Britain this year may not be an all-time record, but is by far the largest in living memory. Probably about 3,000 acres of winter rape were sown in September, 1966, for harvest in July of this year and about 30,000 acres of summer rape were sown in spring for harvest in August or September. This is about seven times the average annual acreage since the crop was reintroduced commercially in Britain in 1951. Historically, however, the cultivation of rapeseed for oil has played a significant role in British agriculture. The first oilseed crushing mills built in this country were almost certainly constructed to deal with indigenous rapeseed crops¹ and following the draining of the Fens in the 17th century rapeseed (or coleseed) was extensively grown, providing sufficient oil and cake to meet home needs and supply an export market.² In the 19th century improvements in transport facilities enabled imported tropical oilseeds to compete successfully with home-grown crops and in Britain, as in other European countries, oilseed production declined.

In the earlier literature the nomenclature of brassica species is confusing, but it is likely that the biennial form of *Brassica napus* was the dominant rapeseed type in Britain in the 17th and 18th centuries, as it is today in Europe. Oilseed varieties of *B. campestris* were also grown in England² and an annual variety of *B. campestris* was recommended to farmers here when rapeseed production was revived in the early 1950s. To make the situation even more complex, varieties of *B. juncea* are quite extensively grown for oil in India, Pakistan and China, and seed of all three species may be classified commercially as rapeseed.

Geneticists have now defined the inter-relationships between various brassica species. Thus *B. nigra*, *B. oleracea* and *B. campestris* are primary species whereas *B. napus*, *B. juncea* and *B. carinata* are derived species which have arisen as a result of natural crossing between two of these primary types. Recently plant breeders have synthesized new forms of *B. napus* by deliberately crossing *B. campestris* and *B. oleracea* types and so have extended the range of genetic variability in *B. napus* to provide additional opportunities for the selection of promising agricultural varieties. Recently in Britain *B. juncea* (Trowse mustard) has replaced *B. nigra* as a source of seed for the condiment industry but it is not grown for oil here or elsewhere in Europe, and the choice for oilseed production rests between *B. napus* and *B. campestris*. Since there are annual and biennial forms of both species, four potential

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crops are available—each differing sufficiently in agronomic characteristics and potential merits for specific circumstances to be worthy of separate consideration.

Winter rape

B. napus var. *oleifera* subvar. *biennis* is much the most widely grown type in Europe and probably accounts for more than 75 per cent of the total acreage. In most areas it is significantly higher yielding and produces seed which is larger in size and higher in oil content than any other type. For optimal yield it must be sown fairly early—before the end of the second week of September in central and southern England. The crop is normally sown at a seeding rate of 6–8 lb per acre in drills wide enough apart to allow inter-row cultivation, but herbicides to control grass weeds or volunteer cereals may be used either before or shortly after crop emergence. Heavy applications of nitrogen (circa 150 units/acre) are usually economic, and are supplied mainly—if not entirely—as a top-dressing in very early spring. However, the nitrogen status of the soil should be taken into account in determining the level of nitrogen manuring; for example, no more than 80 units may be needed if soil reserves of nitrogen are high, but up to 200 units could be worth while when the soil reserves are low, for example, following a sequence of cereal crops. Phosphorus and potassium requirements are said to be similar to those of winter wheat under comparable circumstances, but few data are available from British trials. Winter rape is not normally directly combined at harvest; more commonly it is windrowed and left in the swathe for ten–fourteen days before threshing out with a combine fitted with a pick-up attachment. The seed ripens to some extent, and dries out considerably, in the swathe—the crop may therefore be cut before serious shattering losses occur and the harvested seed will rarely need to be dried artificially before storing. From a very early September sowing the winter rape crop in central and southern England will usually come to harvest in late July, before the main cereal harvest.

Winter turnip rape

B. campestris var. *oleifera* subvar. *biennis* is of only local importance in Europe. It is less prone to severe frost damage in winter and is sown in areas of central Sweden and northern Germany where winter rape is considered insufficiently winter hardy. Since the varieties of winter rape available are quite frost-hardy enough for England, winter turnip rape is unlikely to merit serious consideration for cultivation here.

Summer rape

B. napus var. *oleifera* subvar. *annua* represents about 25 per cent of the rapeseed acreage in Sweden and less than 10 per cent of the rapeseed grown in Poland and Germany. It is of little importance in central France, but there has been a sharp increase in acreage in northern France where it now vies in popularity with winter rape. In central and southern England the end of March or very early in April is a suitable time to sow. Later sowings, which permit some weed control by cultivations before drilling, are not uncommon, but, as summer rape is rather sensitive to spring drought, the practice is not without risk. Earlier experimental studies of the effects of changes in plant population and spacing arrangement suggested that drill

rows could range from 6 to 18 inches and seeding rates from 5 to 12 lb per acre without significantly influencing productivity. Inter-row cultivations to prevent serious weed infestation is feasible when the crop is sown in drills more than 12 in. apart; on relatively clean land narrow drills (6 or 7 in.) are likely to be preferred. Research to determine satisfactory methods for control of broad-leaved weeds in rapeseed with herbicides is in progress in many countries; preliminary results are promising and when success is achieved the present trend towards narrow rows will become common practice. Soil with a satisfactory lime status is essential for maximum yield, and a nitrogen supplement of the order of a 100 units/acre will normally be necessary. Since summer rape grown in this country almost invariably follows a succession of cereal crops, even higher levels of nitrogen may be required on lighter soils. In practice, applications of phosphorus and potassium are subject to greater variation, reflecting local differences in soil fertility and the paucity of experimental data. At harvest, summer rape, like winter rape, can be windrowed and later threshed from the swathe—this is the general practice in Canada—but direct combining is possible and is becoming increasingly popular in Britain. Much more care is necessary than with cereals in choice of date of harvest. Experimental results suggest that no more than seven days elapse from the time the crop reaches maximum yield of seed and oil until losses through shattering become severe. Also, seed harvested by direct combining will need to be artificially dried (moisture content must be reduced below 10 per cent for safe storage) and the rate of drying will determine the speed of harvest. Damage may be caused to the oil content if drying is carried out at too high a temperature with a continuous drier. It has also been found that the ventilated types of bin are not suitable for the crop, due to their resistance to airflow.

Summer turnip rape

B. campestris var. *oleifera* subvar. *annua* is the least popular of the four rapeseed types in Europe, but accounts for about 80 per cent (nearly one million acres per year) of the Canadian crop. It is shorter growing and less productive of seed and oil than summer rape but earlier (hence its importance in Canada where it ripens before autumn frosts) and less prone to shattering when ripe. Crops of summer turnip rape can therefore be combine harvested directly without difficulty.

Pests and diseases

Pigeons are a serious problem in autumn-sown crops and may be a significant local hazard even in spring-sown crops. The most important insect pests are pollen or blossom beetle, pod weevil and pod midge. The pollen beetle attacks the buds and control measures may be applied before the flowers open and with little danger to bees. Seed weevils lay eggs in young pods, the developing larvae eat seeds and then leave the plant by boring exit holes in the pod. The pod midge is unable to puncture the walls of undamaged pods and usually effects entrance through the exit holes of the seed weevil. In consequence, damage from the pod midge is nearly always associated with damage from seed weevil. Treatment against pollen beetle at the yellow bud stage will give some protection against weevil, but a further treatment as near to flowering as is possible, consistent with avoiding damage to bees, may be necessary.³

So far, no fungus diseases of importance have been reported in Britain and they are a minor problem only in Sweden.⁴ Some concern is being expressed, however, at the recent incidence of stem rot, caused by *Phoma lingam*, on winter rape crops in central France.

Yields

The ranking of rapeseed types in order of yield is winter rape, winter turnip rape and summer rape approximately equal, summer turnip rape. Oil content follows a similar order, ranging from about 46 per cent of the dry weight of the seed in winter rape to 40 per cent in summer turnip rape. In Sweden extensive data collected over the past 15 years shows that, on average, commercial crops of winter rape yield about 50 per cent more than crops of summer rape (18 cwt/acre as compared with 12 cwt/acre). There are no comparable statistics for Britain, but the information available suggests that the yield differential between the two crops is not quite so marked and is more likely to be 20–25 per cent. Over the past five years average yields of summer rape in commercial crops here have been around 15 cwt/acre. This is appreciably higher than figures reported from any Continental country and there is little doubt that yields of summer rape, whether considered in absolute terms or relative to yields of the major cereal crops, are more favourable here than in other western European countries.

Oil and cake quality

The chemical composition of all vegetable oils will vary somewhat according to variety and environmental conditions, but the content of fatty acids in rapeseed and soya bean oil, shown in Table 1, is representative of normal samples.

Table 1 Approximate composition of rapeseed and soya bean oil

Fatty acid	Oil from seed of		
	<i>B. napus</i>	<i>B. campestris</i>	<i>Soya bean</i>
	% content		
Palmitic	2–4	2–3	10
Stearic	1–2	1–2	5
Oleic	9–24	14–26	25
Linoleic	13–16	12–18	55
Linolenic	5–12	7–12	5
Eicosanoic	7–15	8–12	—
Erucic	36–54	22–46	—

As the figures show, rapeseed oil is characterized by a high content of erucic acid. This makes it suitable for specific industrial purposes. The importance of the oil as an illuminant in oil lamps is now of historical interest only, but rapeseed oil is still considered superior to mineral oils as a lubricant for marine and jet engines. In America the production of general purpose grease is increasing rapidly and in Canada rapeseed oil is now replacing castor bean oil in these products. Apparently there is no published information on the potential industrial demand for rapeseed oil in this country, but imports of rapeseed, to produce oil destined almost exclusively for industrial outlets, have risen from around 10,000 tons per year in the decade 1950 to 1960 to more than 40,000 tons in 1966. In the main rapeseed producing countries, however, the oil is used predominantly for edible



Windrowing oilseed rape crops at harvest

purposes. Rapeseed oil ranks fifth amongst edible vegetable oils in total world production, being exceeded by soya bean, peanut, cottonseed and sunflower. The edible oils are used in the production of salad and cooking oils, and in margarine manufacture. In Britain there is some prejudice against rapeseed oil for edible purposes. In part this may stem from the fact that the rapeseed imported until recently included seed of *B. juncea*, which produces an oil of pungent quality. Even with seed of *B. napus* and *B. campestris*, however, the high solidification point of the erucic acid fraction militates against the use of rapeseed oil for salad and cooking oils. For margarine manufacture the amounts of the different edible oils incorporated depend on availability and price. Significant quantities of marine or animal fats may be used, but in Britain in recent years soya bean oil has been a major constituent and, until 1966, rapeseed oil was not used at all. By way of contrast, in Sweden, where rapeseed production averages about 150,000 tons per year, two thirds of the crop is bought and crushed by the margarine manufacturers and household margarine contains around 30 per cent rapeseed oil. Nonetheless, a reduction in the content of erucic, eicosanoic, and linolenic acids, and an increase in the linoleic acid content of rapeseed oil would further improve prospects for edible use. Considerable progress towards the attainment of these goals has been made by plant breeders in Canada⁵ and Sweden⁶. A summer rape variety, completely free from erucic acid, but with the same total oil content as standard varieties, has been developed in Canada. The oil from this variety was extensively tested, with excellent results, by the food processing industries in the winter of 1966-1967. Less spectacular, but nonetheless significant, improvements have been made in other aspects of fatty acid composition in rapeseed oil⁷. Moreover, parallel advances in the quality of rapeseed cake have been made⁸. Rapeseed cake contains small quantities of thioglucosides which are themselves harmless, but may be converted into isothiocyanates and oxazolidinethione—the so called 'mustard oils'—with adverse effects on growth of some animals. Problems have not usually been encountered in using rapeseed cake in rations for cattle and sheep, but deleterious effects on pigs and poultry have occasionally been recorded. In some countries, therefore, the amount of rapeseed cake which could be used in high protein feedingstuffs was

limited by law. Recent improvements in processing techniques have largely eliminated the problems of 'mustard oils' in cake prepared from seed of *B. napus* and *B. campestris*. The limitations on the use of rapeseed cake in Canada have now been rescinded and, with rapeseed cake equivalent in protein quality with soya bean meal, the quantity being used in livestock feed is rising rapidly.

Future role

The results of recent research will ensure an increasingly important role for rapeseed production in world agriculture. Since the war the crop has become established in areas where it was previously unknown or of negligible importance, as in Sweden where 150,000 to 200,000 acres are grown each year and in Canada where more than 1½ million acres have been grown in each of the last three years, while European acreage and production has nearly trebled over the last decade. The stimulus in Europe, however, has been high Government support prices (£55-£66 per ton in Sweden, France and Germany over the past decade). World trade in rapeseed is dominated by Canada—responsible for 75 per cent of all rapeseed exports in recent years—and world prices are geared to Canadian production costs. Thus the price paid to Canadian farmers has been £35 to £40 per ton in recent years and the price of rapeseed imported into Britain in 1966 averaged £48 per ton. The bulk of the 1967 British crop is being grown under contract at prices of £38 to £40 per ton. Whether British farmers will find the crop economical to grow at this price level is a matter for conjecture which the 1967 results will help to resolve. Present interest here in rapeseed production, however, is related to the possibilities of oilseed rape as a break crop in intensive cereal rotations, and the profitability of the break crop, although clearly important, is not the sole criterion of merit. Oilseed rape is well adapted to the main areas of cereal production in this country, and it is neither susceptible to, nor a carrier of, cereal diseases. With the possible exception of a windrower the machinery for crop production and harvest is available on all arable farms and rapeseed production may provide an opportunity for the control of grass weeds prevalent in cereals. Finally, there is ample evidence from Europe that oilseed rape is an excellent precursor to cereal sowings. It is significant that when the potential problems raised by intensive cereal production were foreshadowed in Sweden in the early 1950s, oilseed rape was chosen and encouraged as a break crop. The establishment of oilseed rape as a permanent feature of Swedish agriculture is evidence of the satisfactory results achieved.

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This article has been contributed by E. S. Bunting, B.Sc., Ph.D., A.K.C., who has been with the Agricultural Research Council's Unit of Experimental Agronomy at the Department of Agriculture, University of Oxford, since 1946.

Fen Peats —

Their future

P. E. Cross *Director, Arthur Rickwood Experimental Husbandry Farm*

The fate of the black peat fens is sealed. As long as they are drained and cultivated they will produce richly but in producing die. The peat, a wasting asset, is drained and farmed only at the cost of its ultimate and inevitable destruction—The Black Fen (1956) A. K. Astbury.

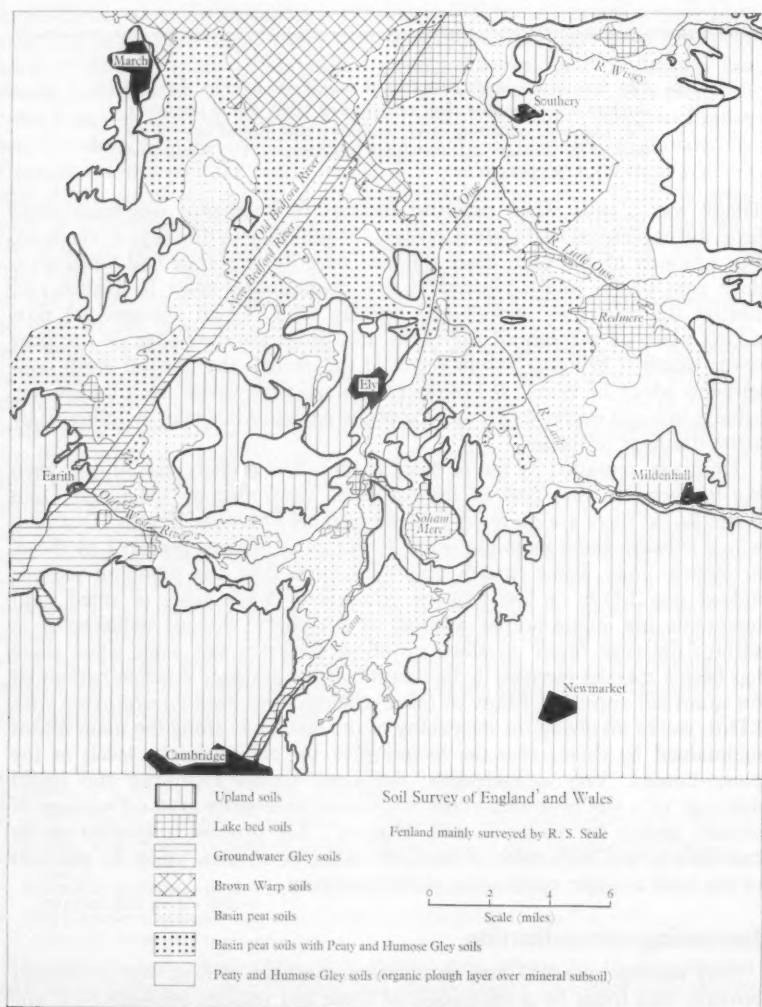
THERE was a time when peatland farmers believed that well-maintained farm dykes were all that were necessary for the efficient drainage of the land. For upwards of 300 years since the fens were drained they had relied on a deep peat profile and a reasonably low groundwater table to absorb and control the effects of rainfall and melting snow. Great changes are now taking place as a result of the rapid and progressive wastage of the peat cover which is bringing within reach of the plough the mineral earth constituents which lie below. It follows that as the peat wastes the groundwater table is brought nearer to the surface of the land and this may be followed by acute drainage problems.

Drainage, regarded by fen farmers as their first priority, has always been big business. In that part of the fen basin controlled by the Great Ouse River Board there are no fewer than 80 Internal Drainage Boards (Districts) which between them maintain some 74 pumping stations powered by diesel or electric units. Some Boards may have more than one pumping station; indeed one I.D.B. in the mid-fen comprising 5,500 acres of rated land maintains five pump-houses around its periphery. Serious deficiencies in surface drainage began to show up about 20 years ago since when there has been a marked increase in the number of tile drainage schemes submitted for grant aid approval. Many of these schemes have been co-ordinated with I.D.B. works involving the deepening of the bed levels along the main drains maintained by them; also the lowering of the cill or intake levels at the pump-houses. Very considerable shrinkage occurs following the initial drainage of a wet peat area. This is followed by a more gradual wastage of organic matter by oxidation and 'blowing'. The process is speeded up by cultivations and high rates of fertilizer usage in an area where 87 per cent of the land is under continuous arable cropping.

Increasing mineralization

Peat wastage, gradual and almost imperceptible at first, was eventually brought into focus by a succession of three wet seasons between 1956 and 1958 when cultivation problems under high-water table conditions forced

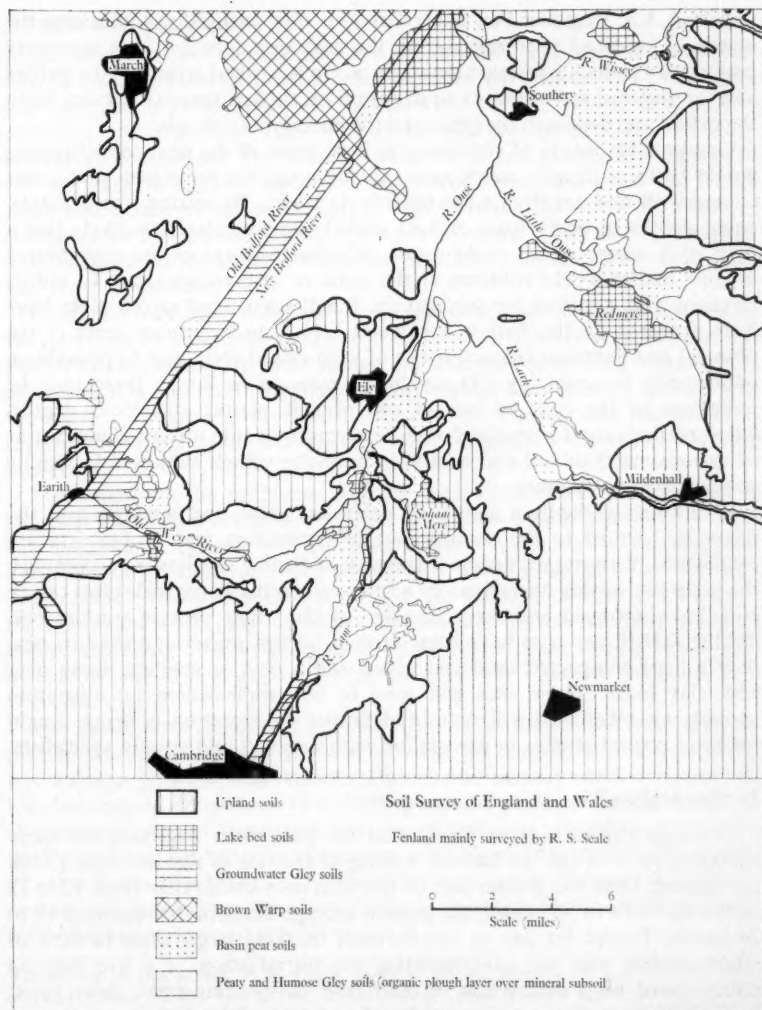
farmers to look into what had been happening. The various factors were discussed at farmers' meetings and in articles written for fen county newspapers, but it was not until the *Farmers Weekly* published a series of articles under the title of 'The Vanishing Fen' that really serious attention was given to the problem. There followed a series of meetings in Cambridge and a sponsored visit of fen farmers and technicians to the Netherlands, in which the late Arthur S. Rickwood, C.B.E., took a great personal interest and which finally resulted in his gift to the Nation of 150 acres of peatland for development as an E.H.F. on which peat wastage and other fen farming problems could be studied.



Sketch map of 1963 distribution of fenland soils

Peat wastage and its effects on the future productivity or range of cropping was also discussed at a N.A.A.S. Regional Symposium at which Seale and Hodge of the Soil Survey of England and Wales compared present day levels of peat with what they were in 1880 when Miller and Skertchly first surveyed the area. They also ventured an opinion on what the fens would be like in, perhaps, 40 years time. Comparisons between the present (1963) and the future are shown in the two maps.

The Survey, largely the work of Mr. R. S. Seale, revealed that the further removal of 24 inches of peat will lead to a vast increase in 'skirt' soils unless decay can be arrested, failing which peat soils will become a minor part of



Sketch map of probable distribution of fenland soils after further wastage of up to 24 in. of peat

the fenland scene. If this happens the peat areas remaining will be concentrated along the river valleys fringing the fens and, for a time, in Methwold and Feltwell Fens on the Norfolk boundary and Conington and Holme Fens in Huntingdonshire. When the peat fens were first drained and brought into cultivation they comprised some 345,000 acres of land. Today it is estimated that no more than 250,000 acres of land with a discernable peat cover remains. Those peat remnants which are substantially mixed with the clays, silt alluvium and sandy gravels which lie below are now known as 'skirt' soils.

Assessing the problem

A N.A.A.S. Regional Fen Study Group is now engaged in forecasting the nature of peatland problems during the next two decades. As a necessary preliminary to such a forecast the study group has asked area working parties and the regional soil scientists to delineate on surface maps of the fen basin the nature and depths of the peats and the underlying subsoils.

One possible means of stabilizing at least some of the peat soil situations would be to artificially create new soils by using the remaining peat cover to mix with and ameliorate the underlying layers. By mixing, for example, equal depths of peaty loam and its underlying silty clay it is likely that a deep, rich organic loam could result. Whether wastage of the now diluted organic matter would continue at the same or at a reduced rate is, unfortunately, still a matter for speculation. Small scale hand mixed plots have been prepared on the Arthur Rickwood E.H.F. to determine some of the physical and chemical characteristics of such mixed soils, and to provide an opportunity for studying CO₂ evolution rates in so far as these may be indicators of the rates of loss of soil organic matter at various depths. Other preliminary studies which may be necessary would include comparisons of various mixes of soil and subsoil in lysimeter vessels subjected to strictly controlled water regimes.

If dilution in depth is shown to delay oxidation and wastage, and the mixes best suited to the maintenance of production and profitability are established, then the next stage is the task of finding out how to accomplish the necessary mixing operations on a field scale so that large scale plots can be laid down, cropped and the economics of the whole process worked out. On the E.H.F. two sites have been selected for this purpose; a shallow peat over a hard compacted sand and gravel and a peat of medium depth over silty clay loam. These sites will need to be supplemented by outstation projects on other peat soil types and farmer co-operation is being sought for joint project studies in association with regional and county specialists.

Is there time?

Drainage engineers have shown that the peat cover overlying the more southerly parts of the fen basin is wasting at the rate of not less than $\frac{1}{2}$ inch per annum. Over the greater part of this area peat levels range from 12 to 15 inches up to 24 to 30 inches; the general average being in the region of 18 to 24 inches. Except for one or two forward thinking larger scale farmers or estate owners who are contemplating the introduction of a live farming policy based on a proportion of their land to rotation grass, dairy cows, beef cattle or sheep as a means of prolonging the life of the peat, the fen farmer at large, born into a tradition of high value cash crop production

is unlikely to change it for any other system. Less likely to change are his workers, long inured to a 7 a.m. to 3 p.m. working day and, in the case of skilled piecework hands, a five day week!

In the absence of a mixed farming policy two courses of action are open to the tillage crop producer: either to farm on regardless of the consequences or by meeting and attempting to deal with the problems associated with the wasting peat as they arise. In the case of older farmers this problem may well fall to be dealt with by others. The alternative line of thought is in anticipation of the ultimate. Is it possible to farm successfully on all types of worn down peatland, if not, are there means of prolonging the life of the peat residues still in being?

Answers to problems

The solution is not an easy one for contemplation. Firstly, if soil modification by mixing is shown to be practicable, then the economics of the whole process must also be financially worth while to the farmer. Soil mixing machines are large and expensive and are likely to be operated by heavy machinery contractors. Problems associated with soil mixing are damage to soil structure for a period and the disruption of surface drainage. The Dutch insist that whenever soil modification works are carried out a tile drainage scheme must be installed before mixing takes place. They also recommend a stabilization period under a temporary ley before the land is brought back into crop production.

Finally, it may be that certain of the silty clay loam fractions underlying the peat in some areas may be just as good for crop production as the original peat, and little change in farming may be necessary apart from adjustments in cultivations and the maintenance of an efficient tile drainage system. It is the heavy silty clay alluviums or the Jurassic clays composing the fen floor, together with the sand and gravels which constitute the most worrying prospect.

These then are the problems. Already there are areas in the fens and in the Don Valley in Yorkshire where the peat cover over a sandy substratum has disappeared entirely and the land is likely to go out of farming into afforestation or Christmas tree production. Over other parts of the fens where claying was undertaken years ago, the presence of back-filled peat in the clay dykes is the only indication that the land was at one time under an appreciable cover of peat. Other farms, once noted for the quality production of carrots and celery, are no longer used for the intensive production of vegetable crops.

The Dutch have found that peat wastage, under their systems of intensive production, takes place at about 2 per cent per annum and to counteract this wastage growers of horticultural crops and nursery stock are applying top-dressings of upwards of 10 tons of sphagnum peat, per acre, per annum. We have no areas of virgin peat beds for exploitation; therefore, it is all the more important for us to try and conserve the slender reserves which we now till. One hopes that there is still time to evaluate and investigate the problems and to put into action measures destined to maintain the productivity of fenland farming for many years to come.

The author of this article, **P. E. Cross, O.B.E., N.D.H.**, was for 20 years County Agricultural Officer for the Isle of Ely, before taking up his present appointment as Farm Director of the Arthur Rickwood Experimental Husbandry Farm, Cambridgeshire, where peat wastage and soil amelioration studies form an essential part of the experimental programme.

Investment Grants in Your Annual Accounts

G. H. Camamile and E. S. Carter

THE new system of incentives for investment introduced for industry by the Industrial Development Act of 1966 has been applied to the Agricultural Industry by part II of the Agriculture Act 1967. This replaces the former investment allowances to farmers, which were withdrawn from 17th January, 1966, by three new agricultural grants.

1. Grants on investments in fixed equipment, fixed plant and fixed machinery and land improvements not receiving grant under other schemes for the purposes of a full-time agricultural business.
2. Grants on new tractors and self-propelled harvesters currently licensed as agricultural machines.
3. Supplements to grants claimed after 16th January, 1966, on the Farm Improvement Scheme, Horticulture Improvement Scheme and Farm Water Supply Grants.

If a grant is claimed the same expenditure cannot qualify also for an initial allowance.

The rate of grant for expenditure on fixed equipment incurred in 1967 and 1968 will be $12\frac{1}{2}$ per cent. For expenditure on tractors and self-propelled harvesters incurred between 1st January, 1967 and 31st December, 1968, the rate of grant is 15 per cent. For expenditure incurred after 17th January, 1966, but before 1st January, 1967, the rate is 10 per cent.

When a farmer's annual accounts are prepared for a year in which he has received investment grants—and this will not embrace a period earlier than 17th January, 1966—his accountants will decide, in consultation with the farmer, how the amounts received from investment grants might be shown in the accounts and the reasons for choosing one method rather than another.

The recently published recommendation of the Institute of Chartered Accountants in England and Wales is as follows:

'8. Investment Grants should be treated as a form of deferred credit which should be reflected in the profit and loss account over the estimated useful lives, as computed for depreciation purposes, of the assets to which the grants relate. Either of the following treatments is appropriate:

- (a) Grants should be applied in reduction of the purchase price of the assets to which they relate, with a consequential reduction in the amounts charged to revenue by way of depreciation of the assets or writing off the relevant expenditure. If the amount of the grants is material the description of the amount at which the assets are shown in the balance sheet should make it clear that the grants have been deducted; or

- (b) Assets should be shown in the balance sheet at cost before the deduction of grant and the grants shown in the liabilities section, separate from capital and reserve, as a deferred credit pending transfer to profit and loss account at a rate consistent with that at which the relevant depreciation charge is computed.'

Although this recommendation related to Board of Trade Investment Grants, the same principles should apply to agricultural investment grants.

Essentially, then, the English Institute of Chartered Accountants regards the Investment Grant as a revenue receipt, effectively reducing the annual charge for depreciation in subsequent years' accounts.

A different view is taken by the Research and Publications Committee of the Institute of Chartered Accountants of Scotland. The majority view of this committee was that the preferred method of dealing with an investment grant in accounts was to:

'Transfer the grant to capital reserve, less a proportion transferred to taxation equalization account and brought back to profit and loss account over the life of an asset as an offset against the extra tax suffered by reason of the reduced written-down allowances'.

This view, then, is to show the investment grant as an addition to the capital of the business. The asset values, whether the assets were acquired before investment grants were introduced or afterwards, will be shown on a consistent basis and the annual charge for the depreciation will, correspondingly, also be on a consistent basis notwithstanding any variations in the rate, or rates of investment grants from time to time over the years.

The method recommended by the Scottish Institute is perhaps more complicated, certainly than the first of the English Institute's recommended methods, but this method shows the contribution the Government has made to the capital of the business to encourage investment, and what is more, ensures a consistent basis of comparison in the charge for depreciation in each year's accounts.

The transfer for tax equalization is of course easier to make in the case of a company than it is in the case of an individual, and it is perhaps for this reason that it is most likely that the first recommendation of the English Institute will be followed in the majority of farm accounts.

This is the simplest method and has the special merit that it conforms to most taxpayers' own understanding of the practical effects of the investment grant system.

As a rule, in the accounts of individual traders or partnerships, the investment grant received or expected to be received will be deducted from the cost of the asset and depreciation on the asset will be worked out—as it is for tax purposes—on the net cost after deducting the grant.

NEXT MONTH'S 'AGRICULTURE'

The November issue will be a Pre-Smithfield Show number. It will contain a number of articles on livestock, including a special feature on mechanized feeding and bulky feeds.

The Common Market

The Main Marketing Scheme for Horticultural Produce



G. W. Ford

THE Community is dealing with horticultural produce in two ways: certain products have or will have separate marketing schemes to suit their special requirements. For example, there is already in operation a comprehensive scheme for managing the marketing of olive oil and allied products. An interim scheme of modest proportions exists for wine and further extensions are envisaged by November, 1969. Plans are being developed for separate marketing schemes for tobacco, hops, textile plants (flax and hemp), non-edible horticultural produce (flowers, plants, shrubs) and cork. It may also be, although no decision has yet been taken, that there will be a marketing scheme for potatoes; in any case it is the intention of the European Economic Commission to produce a draft scheme in 1967 for the consideration of the Council of Ministers.

Nearly all other fruit and vegetables (including sub-tropical produce grown in Italy and southern France) are dealt with in a single main scheme. It is this scheme and its development which is the subject of the rest of this article.

Fruit and vegetable production

The percentage relationship of production to consumption in the member states in 1963 was:

	Vegetables	Fruit (other than citrus)
Germany	64	57
France	97	99
Italy	116	120
Holland	165	116
Belgium/Luxembourg	113	74

In 1964 the Community produced 24,000 metric tons of vegetables, of which over 10,000 tons were Italian and nearly 7,400 tons were French.

In 1964 the Community produced over 15,000 metric tons of fruit of which nearly 8,900 tons were Italian; France and Germany each produced about 2,500 tons.

In the table below can be seen the relative importance of various vegetables and fruits sold in the Community:

1964-5 Metric tons	Community production sold through the Market				
	Germany	France	Italy	Holland	Belgium and Luxembourg
Cauliflowers	73	353	576	59	63
Tomatoes	38	522	2,665	232	87
Apples	602	832	2,046	515	180
Pears	211	275	862	146	70
Peaches	17	376	1,123	1	13
Table grapes	7	267	737	6	11

Intra-Community trade

Intra-Community trade is especially concerned with table grapes, apples, peaches, lettuces, tomatoes, cucumbers and cauliflowers. This trade has been developing fast and has not yet reached its peak. While between 1958 and 1965 imports from third countries increased by 48 per cent, intra-Community trade in the same period increased by 140 per cent. Germany in particular is taking much more from other member states than she did before the Community came into being. In 1958 intra-Community trade amounted to £78 million: in 1965 it was £185 million.

The import and export trade

If citrus fruit is excluded, then the net overall position is that the Community is about 92 per cent self-sufficient in fresh fruit. The Community is a net exporter of vegetables: the total value of its production is about 3 per cent more than consumption. However, these figures mask the seasonality and perishability of fruit and vegetables; thus among the Community's principal exports (especially Dutch and Italian produce) are tomatoes, lettuces, lemons, grapes, apples and peaches. The principal imports are citrus fruit, apples and bananas. In 1965 the Community imported from non-members £194 million of fresh and frozen fruit and vegetables and exported £96 million.

The first stage in the marketing scheme

The first stage in the Community's marketing scheme for fruit and vegetables was established in July, 1962, but in comparison with other major agricultural commodities the market management was limited. Plans were made for customs duties for intra-Community trade to be progressively reduced. From July, 1962, quantitative restrictions on intra-Community trade were abolished for extra quality grade produce; in January, 1964, they were removed for Grade I produce and in January, 1966, for Grade II produce.

An important step of a different character in developing an organized market was the provision of compulsory grading of produce in regard to quality, size, presentation and packaging. At present quality standards both in respect of domestic and foreign produce apply to cauliflowers, tomatoes, apples, pears, peaches, citrus fruit and table grapes. As from 1st January 1968, quality standards which apply to intra-Community trade will also apply to domestic trade for lettuces, endives, onions, apricots, plums, spinach, garden peas, beans, carrots, artichokes, cherries and strawberries



Tomatoes growing under glass in the Netherlands

There have been until recently three grades, viz., Extra, Grade I and Grade II, but now a supplementary (minimum quality) grade has been created which is intended to apply only to local trade. Imports are not permitted if their standard is below Grade II. The grading extends to the retail level: traders are required to indicate the quality, category, variety and origin of the product.

The 1962 Regulation also contained a not greatly used safeguard, i.e., power to secure more adequate protection of a local or national market (see second stage, below). Belgium used this provision to protect her hot-house grapes. On one or two occasions other states used the power for other produce.

The second stage

The claim put forward especially by the Italians that the above-mentioned safeguard clause¹ provided insufficient protection was accepted by the Council of Ministers at their 'Marathon' session in December, 1964, when it was agreed that further provisions would be made.

Under arrangements which came into force in 1965, the Community determines annually 'reference prices' to apply at the Community's ports or frontiers. These prices are determined in relation to prices ruling over the previous three years in representative markets in the Community. If produce from non-member states is imported at prices lower than the reference price, then a duty of the difference (called a countervailing duty) will be charged, together with any customs duty. Reference prices have been determined for plums, peaches, open air tomatoes, cherries, table grapes (grown in the open), apples, pears, lemons and oranges.

¹Article 11 of Regulation No. 23/1962.

The third stage

In July, 1966, agreement was reached by the Council of Ministers on the principles to be followed in the third stage of the Community's fruit and vegetable marketing scheme. It is to some extent an interim scheme as the whole system is due to be reviewed before January 1970. The main principles are based on the following:

1. the organization of growers and the terms on which member states may give financial aid to growers' organizations;
2. arrangements for intervention on the market when the price of specified produce is depressed;
3. the conduct of trade with member states and non-member states;
4. the commitments in respect of Community funds.

With the exception of the final arrangements for trade with non-member countries and with a regulation (still in draft) in respect of growers' co-operatives and analogous bodies, the above principles were set out in regulations which come into effect on 1st January, 1967.

Growers' co-operatives

In the case of the organized Community marketing for other produce, the co-operative played no significant part. However, in the fruit and vegetables sector, it is cast for a specially important role. The percentage of the produce in the Community marketed co-operatively has been growing in recent years, and doubtless this scheme and the above-mentioned draft regulation will increase the importance of fruit and vegetable co-operatives and the amount of produce that is marketed co-operatively.

The co-operatives remain voluntary bodies and no producer is forced to join the local one. In some parts of the Community the grower finds it difficult to trade effectively except through the co-operative and it can be expected that this tendency will increase. The European Economic Community attached importance to two principles in co-operative organizations; the grower member must sell all his produce through the co-operative, and no single one, having regard to the competition provisions of the Treaty of Rome, should be responsible for marketing more than 5 per cent of the Community's production of any product.

The fundamental aims of the co-operatives are to improve the position of the grower in the market, to improve the quality of the product and to adapt the supply to the greatest extent possible to the needs of the market. They will also be able to function in regard to the transport, sorting, grading, packaging and price standardization of produce.

To assist in the establishment of new co-operatives, member states are authorized under the Regulations to give grants to those newly formed. These grants may not exceed 3 per cent, 2 per cent and 1 per cent respectively of the value of the produce marketed by the co-operative in the first three years.

Market support and intervention

Co-operatives may fix reserve prices for produce. Members will not sell below these prices and if, as a result, produce is unsold then members will be compensated by the co-operative from a special fund. This fund will be

financed by members in relation to their throughput, and during the first five years member states can help the fund with loans. The member states may determine the maximum of the reserve price.

Market support operations apply to cauliflowers, tomatoes, apples, pears, peaches, table grapes, oranges, tangerines and lemons. No doubt as necessary other produce will be added in subsequent years. For these products, the Council will fix basic prices and buying-in prices. The prices may be varied seasonally and need not be prescribed at the start or end of the season when little or no produce is being marketed. The basic price is the arithmetic mean of prices over the previous three marketing years on representative Community market(s) in the surplus areas, i.e., where prices would be most likely to be the lowest in the Community. These markets must account for 20 to 30 per cent of Community output.

The buying-in price is the price at which the member state may intervene by buying up the surplus that is depressing the market; at this point, too, a member state may compensate growers' co-operatives. Up to December, 1969, the member states are free to fix the buying-in prices in their own markets, subject to their not exceeding 70 per cent of the appropriate basic prices. Intervention may not take place outside the normal season and is only permitted when a 'state of crisis' or a 'state of serious crisis' exists.

A 'state of crisis' is where for three consecutive market days the market price is below the buying-in price plus 15 per cent of the basic price. In such cases the co-operatives may intervene: products withdrawn or bought up by the co-operatives must be disposed of in such a way as not to disrupt the normal market, e.g., for cattle feed. The member states may compensate the co-operatives in respect of the intervention. Such compensation may not exceed the buying-in price plus 5 per cent of the basic price, and the total paid out by the state may not exceed 90 per cent of the co-operative's expenditure in compensating growers.

A 'state of serious crisis' is where for three consecutive market days the market prices are below the buying-in prices. In such cases the member states are authorized to buy up the produce of Community origin at the buying-in price subject to such produce conforming to quality and grading requirements stipulated in the basic price. Buying-in ceases when the market prices have, for three consecutive market days, equalled or exceeded the buying-in prices.

Below are a few examples of the new price determinations in units of account (i.e., U.S. dollar equivalent) per 100 kilograms.

Product	1967	Basic price	Buying-in price
Cauliflowers	January	9.3	3.7
	February	7.9	3.1
	March	11.0	4.4
	April	10.1	4.0
Apples (Golden delicious not less than 70 mm)	January	15.1	8.0
	February	16.4	9.0
	March	18.2	10.0
	April	22.3	11.5
	May	25.6	13.0
Pears (Conference not less than 60 mm)	January-March	17.7	9.5

The new scheme includes powers to grant export subsidies to citrus fruit, table grapes, fresh peaches, preserved tomatoes, fruit juice, sweet almonds, walnuts, hazelnuts and chestnuts. These arrangements will be used by member states if the Community's share of international trade is adversely

affected by unfair competition in non-member countries, or as measures necessary to stabilize the Community market. The ceiling of the export subsidy for any product will be the amount of the common external tariff to which may be added any countervailing duties for that product.

As regards intra-Community trade, customs duties, quantitative restrictions and minimum import prices for all intervention produce were abolished on 1st January, 1967. Except for potatoes and sub-tropical fruit, the basic duty is being cut by 20 per cent on 1st July, 1967, and completely abolished by 1st July, 1968.

As regards non-member countries, all the import arrangements are not finalized. For 'intervention produce' it is intended to apply the common external tariff and to abolish quantitative restrictions, but to retain certain emergency powers to deal with situations that depress or that are liable to depress the Community market. These matters are still under discussion.



*Tomatoes ripening off in a glasshouse
in the Netherlands*

Financial responsibility

Although there have been progressive marketing arrangements for fruit and vegetables since 1962, these arrangements have differed considerably from the pattern followed for most other organized markets. A further consequence of this difference has been that there has been no provision made for use of the guarantee section of the Community's Agricultural Guarantee and Guidance Fund up to December, 1966. However, with the new arrangements which include intervention powers and grants to co-operatives in respect of their support to the market, fruit and vegetables like other organized agricultural commodities now receive payments from this Fund: the amount payable from the Fund in regard to intervention is restricted to £21 million. This support includes reimbursement to member states in respect of any export subsidies granted.

Until this year the fruit and vegetable sector has only benefited from the Fund in respect of grants to improve the structure of the industry. In 1965, the grants for fruit and vegetable schemes amounted to nearly £½ million.

Legal enactments

The main legal enactments affecting the fruit and vegetable marketing scheme are as follows:

- The Treaty of Rome: Articles 38 to 47; Regulation 23/1962 providing for the gradual establishment of the organized fruit and vegetable market;
- Regulation 100/1962 determining the arrangements in respect of imports including reference prices;
- Regulation 65/1965 extending the import provisions; Regulation 158/1966 extending quality grading to the domestic markets of the Community;
- Regulation 159/1966 the major extension of the fruit and vegetable market organization including intervention, export subsidies, etc.

This article has been contributed by G. W. Ford, who is Counsellor (Agriculture) to the U.K. Delegation to the European Communities at Brussels. He was previously South-Western Regional Controller of the Ministry of Agriculture, Fisheries and Food and during 1956-58 was Agricultural Development Adviser to the Government of Malta.

Antibiotics in Animal Feeding

A Joint Committee under the Chairmanship of Lord Netherthorpe was set up in 1960 by the Agricultural Research Council and the Medical Research Council to examine the possible consequences of the feeding of antibiotics to farm animals and to consider whether this use constituted any danger to human or animal health. The Committee's report in 1962 supported the continued use of penicillin, chlortetracycline and oxytetracycline, permitted by regulations made under Part II of the Therapeutic Substances Act 1956 for pig and poultry feeding; recommended that permission should be given for the extension of the practice to young calves, subject to specified limitations.

In 1965 the attention of the Councils was drawn to reports on an extension of work in the field of infective drug resistance, previously shown to occur in the *Shigella* group of organisms. This work showed that a pattern of multiple resistance to antibiotics appeared to be occurring among members of the *salmonella* and *E. coli* groups, the former being regarded as of animal origin. The Joint Committee and its Scientific Sub-Committee were therefore reconvened by the Councils to consider these developments: and after considering a report from its Scientific Sub-Committee, the Joint Committee presented a further report to the Councils in 1966.

The recommendations of the Committee were as follows:

1. That an appropriate body with sufficiently wide terms of reference should consider the evidence about the use of antibiotics in both animal husbandry and veterinary medicine and its implications in the field of public health, and make recommendations.
2. That the Veterinary Investigation Service of the M.A.F.F., in conjunction with the Public Health Laboratory Service of the Ministry of Health, should be asked to seek further information regarding enteric infections in calves and on the therapeutic and prophylactic use of antibiotics to control such infections.
3. That, meanwhile, the implementation of the Committee's previous recommendations relating to the supply of antibiotics for use in calf foods—upon which action has not been taken to date—should be further deferred.

The Ministers have accepted the first two of these recommendations in principle, but they are giving further consideration to the part to be played under the second recommendation by the Veterinary Investigation Service and the Public Health Laboratory Service having regard to the resources available to them. The third recommendation is agreed.

A further statement will be made in due course.

Cereal Rotations on the Chalk

The Problems in Wiltshire (2)

G. A. Dowse

An extensive study of this subject by the Wiltshire Agricultural Executive Committee under the Chairmanship of Mr. Trevor Cave of Everleigh, has recently been carried out. The gist of its findings has been partly given in the August issue of *Agriculture*. This article contains further information on this important subject.

It is essential with the general reduction in labour, due to its increased cost, greater mechanization and better farm management, that the labour force should be made to fit the farm system. All too often farmers are not cognizant of the free advice available from the N.A.A.S. to assist them in doing this, particularly assistance with the balancing of combine strength with probable drying and storage requirements.

Labour problems

Due to the lack of this realization, labour costs in too many cases are far too high. The Wiltshire Agricultural Executive Committee felt that the county aim should be 1 man: 200 acres depending upon the intensity of the farm business. Where there is no stock, this is too much for corn, but 2: 400-500 would then be in order. It is quite feasible on certain chalk farms for one man to operate the whole concern himself. In several cases this has already raised a problem of what the man does with himself for several months of the year! Five men would be necessary on a 1,000-acre farm with 700 acres of corn—three for the corn and two for the dairy on 300 acres of grass—excluding the farmer.

Machinery considerations

The largest sized combine-harvester to suit the acreage should be used, again with the aim of keeping the labour force down. It is considered that large-size tractors are not needed although they are ideal for cultivation purposes and this recommendation may well cause some surprise. An essential requirement is to choose a tractor that is also most suitable for the silage-making requirements taking into account team numbers required for silage.

Usually on chalk farms there is an important place for the smaller type of tractor in the 60-70 h.p. range. There seems to be no call for the re-introduction of crawler tractors, as higher powered tractors and better wheel traction obviates the need for them. Four-wheel drive tractors are useful on steep land, but can only be supported on larger acreage farms.

The use of the 'superflow' type of cultivator is a great benefit on chalkland and is particularly good on steep banks on which its value has already been shown in the last three years. The major use is in stubble cultivation for control of grass weeds.

Ploughing

The newer wide furrow type of plough greatly improves the standard of ploughing and the nearer to a 14 in. furrow the better. The overall standard of ploughing is important, but, more important still, is that all trash and stubble is completely buried to the benefit of disease and weed control. The optimum number of furrows per plough should always be fitted, but this is not always done. It is a sad reflection that all too often far too much tractor power is wasted by not using enough furrows or by using the incorrect width of implement.

It is considered most important that the recent drop in the standard of ploughing of chalkland should be reversed. It appears this drop mainly occurred with the advent of the mounted plough and was accentuated by stubbles being cut higher, the lack of use of skim-coulters and the lack of knowledge of many ploughmen about the correct setting of the modern plough. Action in educating the tractor driver is obviously necessary.

The speed at which ploughing is undertaken should be increased and it was felt that there would be an *appreciable* benefit in an extension of round-and-round or square ploughing.

Disease and pest factors

It is essential, in continuous cereal growing, to keep take-all at bay. This is mainly aided by early stubble cultivation to destroy the fungus *Mycelium* and particularly the weed grasses which harbour the disease and enables it to overwinter.

Eyespot can also be important in certain seasons and unfortunately seems to be on the increase. Its effect on yield does not seem to be so serious as with take-all, but if the proportion of wheat in the cereal acreage is to be substantially increased, then it is likely that this disease may be troublesome.

Cereal root eelworm must be guarded against, for once it arises, it is possibly the greatest danger to continuous corn growing on chalk soils. It is already depressing yield without the farmer being aware of its presence which can, of course, be ascertained by soil sampling. Oats increase its incidence and must be kept out of the rotation where CRE exists. The use of Kron spring barley should always be considered where cereal root eelworm is known to exist and yields are unsatisfactory. The pest seems to be a seasonal one manifesting itself most in drought periods and, because of this, all too often a farmer can be deceived. Early stubble cultivation to control most weeds helps prevent build-up. In bad cases up to three years break from cereals may be necessary.

Weed problems

Broad-leaved weeds are *not* a real problem if a selective choice of the correct wide spectrum herbicide is made.

Grass weeds can, however, be a major problem. The use of Paraquat at two pints per acre applied to the stubble gives a valuable check, as does

its routine use each autumn on any grass verges of the field. The use of Dalapon, ATA or TCA is helpful in special circumstances.

Good cultivations, especially ploughing and good stubble cultivations, are still the best weed control. The techniques of using Paraquat in conjunction with rotavation or discing of the stubble with no ploughing at all for cereals cannot yet be fully recommended.

Wild oats

The increase of wild oats causes grave concern and is of heavy economic loss already in certain areas of the county. This menace can be stopped when oats are few by hand roguing *and then burning*. When oats are many, control by herbicides is economic, but their use for at least two years may be necessary. Hand roguing and burning should then finish the job.

The even older technique of seedbed cultivations and then late sowing of cereals has much in its favour, particularly on the larger farms where by necessity there must be some late sown barley or wheat. Early control is absolutely essential to safeguard future profitable continuous cereal production and for seed *no* wild oats can be allowed.

Alternative crops in the rotation

All alternative crops were discussed by the sub-committee, but it seems there is no realistic profitable crop which can take the part of any large acreage of the break. Such crops as potatoes and sugar beet are not acceptable or suitable in the county, either from labour or capital requirements necessitating too high an input for machinery. Future improvement in machine design could however change this. Neither does there appear to be a future for pea growing or brassica seed production except on a very limited individual farm scale. The acreage of oilseed rape is increasing, but the present county yields are not high enough for good profit. Kale or roots are not required.

There might well be merit in the re-introduction of the bean crop as part of the break and the county N.A.A.S. are progressing with trial work on assessing the best varieties of both winter and spring beans, together with optimum row width and seed rate.

Capital requirements

Assuming that the existing chalkland farm was properly geared up for corn production on a 70 : 30 ratio, the lowest capital requirement is on a corn/herbage seed farm for there is little additional capital required for water or fencing. The highest requirement is for dairying and particularly for any large extension of that enterprise, due to the comparatively high cost of buildings, stock, fencing and water.

A sheep enterprise falls between the two limits stated above—even assuming a relatively high intensity. Fencing is the main capital requirement, but can be appreciably reduced by the newer types of electric and nylon fencing.

Final advice

It is appreciated that general recommendations such as those given in the summary of the Committee's report cannot give the best economic

answer for every farm. Each farm case must be considered on its own merits and skilled professional, technical and economic advice should always be obtained. The main points are, however, pertinent. The report gives a good guide to the problems arising in Wiltshire as a result of continuous growing of cereals for several years together with the possibilities of suitable break crops. It is strongly suggested that they should be carefully studied and applied whenever necessary.

The Chairman of the County Agricultural Executive Committee, Mr. J. M. Stratton, in commending the report to his fellow farmers, aptly said: 'Chalk soils, though they have wonderful advantages, are naturally poor. We must be careful how we use them. Farmers should live as though they were going to die tomorrow, but farm as though they were going to live forever.'

1967 Royal International Dairy Show

THE Royal International Dairy Show will be held from 21st to 25th October, 1967, at Olympia, London. It is anticipated that the cattle entries will be fewer than last year, but the 1967 cow and heifer entry at 544 will be 10 higher than in 1966. This is most gratifying and clearly indicates that exhibitors approve the special efforts being made by the Royal Association of British Dairy Farmers to provide three separate sections, (1) for accredited animals, (2) for animals from herds under Test and (3) for animals from herds not participating in the Scheme, at the Show.

Beef from dairy herds

The opening of the Beef Hall at the 1966 Royal Dairy Show was welcomed and a modest increase in the entry this year was anticipated. However, a total of 134 entries in the eight competitive classes, compared with 57 last year, is far greater than had been hoped for. Additionally, the new Dairy Inter-Breed Beef Group competition for the 'Richard Trehane Perpetual Trophy', for which Beef, Dairy and Dual Purpose Breed Societies were invited to enter a maximum of two teams of four animals in each team, has attracted an astounding entry of 23 teams (92 animals). Thirty-four animals included in these teams are also entered solely for the Trehane Competition; this is a highly satisfactory entry.

The Royal Association is satisfied that the 'new look' Beef Section has already made its mark and it is confidently believed that in addition to producers, wholesalers and retailers will be attracted to the Show to see not only completely new methods of judging on a more realistic basis, but also to see and talk with those responsible for introducing the new features within the Beef Hall this year.

Goats

Goat and goatling entries this year are:

<i>Goats</i>		<i>Goatlings</i>	
1967	1966	1967	1966
59	52	44	49

Land Restoration in Northumberland

after Opencast Coal

L. E. Collinson

RESTORING land following opencast mining of coal, to make it fit for agricultural use again, is done in five stages and the first stage commences before the Opencast Executive of the National Coal Board starts work on a site. The final stage is in the hands of the farmer when the land is returned to him.

Responsibility

The application, which the Board has to submit to the Minister of Power for authority to work the coal, has to set out the manner in which the land will be opened up and subsequently restored. Before making this submission the Board negotiates an agreement with all the interested parties, including the Ministry of Agriculture, Fisheries and Food. The Ministry, acting through the Divisional Land Commissioner of the Agricultural Land Service, acts as adviser and agent in all matters affecting the agricultural restorations of the opencast coal site. When the working of a site is approved by the Ministry of Power, conditions are attached to the authorization. These include the Board's responsibility for safeguarding watercourses, prevention of damage by erosion or flooding and the preservation of natural water supplies. However, from the agricultural aspect the most important conditions are those relating to the separate stripping, stacking and replacement of the top soil and the subsoil, also the work to be done after the coaling operations have been completed. These refer to the agricultural treatment, the provision of water supplies, tile drainage and fencing, all of this work ultimately being the responsibility of the Ministry of Agriculture as the agent to the N.C.B.

Opening up the site

The second stage is the implementation of the conditions affecting the stripping and storing of the top and subsoil from the area to be excavated. Top soil only is taken from those parts of the site where buildings are to be erected and machinery will traverse also where subsoil and overburden are to be stacked in dumps. So far as is reasonable, these stripping operations are not done when the land is wet; if heavy soils or clay subsoil are stacked in a wet state they are much more difficult to handle at the time of restoration. Furthermore, if the stripping is carried out during unsuitable weather, top



Spreading top soil

soil can be lost in the subsoil due to 'plunging' by the very heavy machines used for this purpose. An opencast coal site is visited regularly by an A.L.S. officer to see that the soil stripping is carried out in accordance with the conditions.

Invariably the whole of the top soil is preserved for replacement but the quantity of subsoil saved depends upon its quality; however it is usual to strip and stack sufficient to replace a thickness of at least 2 ft.

Replacement of the soil

Stage three comprises the backfilling of the excavated area, removal of site roads and buildings, and the replacement of the sub and top soils. However, before this can be started, plans are prepared by the N.C.B. and their coaling contractor, indicating the approximate contour lines of the surface after restoration. This is essential to ensure that the finished levels will conform with those of the adjacent land and that adequate natural drainage can be provided.

On the smaller sites complete restoration is carried out immediately all the coal has been taken out and pre-planning is fairly simple. On large sites coaling operations may spread over several years so that the site has to be restored in sections, which means that not only must the contour plan be very carefully prepared, but in addition the overburden must be so replaced that its finished level conforms with the plan. On a site which is comparatively flat it is not possible, with only two feet of subsoil and less than a foot of top soil, to adjust a serious mistake in levels.

As each part of the restoration by the N.C.B. contractors is carried out, i.e., first the replacement of the overburden, followed by the subsoil and finally the top soil, one of the functions of the A.L.S. is to see that the levels are in accordance with the agreed contours and that no surface depressions have been left in which water can stand. Also at these inspections test runs with the rooting machine are made to ensure that large stones and other obstructions have been removed from the overburden and/or subsoil. On some sites this presents little difficulty but on others, where the original

rock formation was close to the surface, the quantity of true subsoil can be very limited. In these cases the inspections have to be very carefully done if a good standard of restoration is to be maintained. The stone clearance can be very expensive for the contractor; so it is here on the site, that the personal relationship between the officials of the Ministry, the N.C.B., and the contractor is much more important than conditions on paper, if a satisfactory result is to be achieved.

When the A.L.S. officer is satisfied with the replacement of the top soil, the land is handed to the Ministry for agricultural treatment which covers a period of up to five years. During the early part of this period, and in some cases before, agreement is reached between the Board and the owner, in consultation with the Ministry, about the siting of open ditches, new fencing, planting of thorn hedges and perhaps shelter-belts and the provision of water supplies.

Agricultural treatment by the Ministry

The object of the five-year course of agricultural restoration by the Ministry of Agriculture is to make the land reasonably fit for agricultural use before returning it to the farmer. The first part of this fourth stage is the work required to enable grass to be sown and in the majority of sites in Northumberland the first seeding is allowed to last for two to three years. As a result of the stripping and storing, the structure of the soil in this part of the country is destroyed so that it tends to become impermeable to air and water; opencast soils also run together forming a surface cap and all these conditions prevent water draining away naturally through the soils; the initial problem to be tackled is, therefore, the removal of surface water. The formation of crumb structure, upon which the permeability of the soil depends, is a complex natural process and although mechanical operations can help to speed up the process they cannot replace the natural functions.

In the early years of opencast restoration there were delays of several years before the drainage work was done, but the current practice is for it to be carried out in the third and fourth year of the five-year treatment. The reason for postponing the tile drainage for 3 or 4 years are (i) the possibility of local settlements in the replaced overburden which could be serious, particularly if main drains were affected, and (ii) the risk of the pipes being sealed if covered by top soil which has not had any opportunity of reforming some of its structure.

Subsoiling has proved to be most effective in reducing the waterlogging on the surface and assisting in the creation of suitable conditions to encourage strong and deep root growth. On the heavier soils this is done as soon as is practicable after the land has been handed over to the Ministry. The spacing of the cuts may vary from 4 ft 6 in. to 6 ft, the average depth being about 20 in.; to get the maximum shattering of the top and subsoil the operations should be carried out during dry weather conditions.

Autumn ploughing has two obvious advantages, firstly the weathering of the soil during the winter and secondly reducing the risk of soil erosion and offsite flooding during spells of heavy rainfall. The average annual rainfall on the eastern side of the county is low, but there can be very heavy storms causing severe damage if measures are not taken to prevent erosion. The work required may be just a few plough furrows across the fall of the land, or a more elaborate one comprising a skeleton drainage system with

porous backfill, the trenches being left open during the winter with the spoil on the lower side to act as an additional barrier.

First seeding

Before the final cultivations are started, lime is applied at a rate equivalent to two tons of ground limestone per acre, further applications being governed by soil analysis. The usual fertilizer treatment is 4 cwt per acre 10 : 15 : 10 in the seedbed and for the first sowing a temporary seed mixture is now normally used although a permanent mixture may be sown, but the N.A.A.S. would be consulted on its suitability. Basic slag at a rate equivalent to 7 cwt 14 per cent P_2O_5 is applied in the autumn; in the following spring a top-dressing of compound fertilizer 10 : 10 : 18 is given at the rate of 3 to 4 cwt per acre with a further dressing of 3 cwt 18 : 9 : 9 in the spring of the second full year. The increase in nitrogen is applied to encourage the root growth.

The former occupier of the land is given the opportunity to use the grass during the summer. However this is restricted to the period from May to October, and the farmer is encouraged to cut the grass for hay or silage. This restriction is imposed because opencast soils in the early stages of restoration are very easily poached if grazed by livestock during wet weather, and while grazing does take place after a hay or silage crop has been taken, every endeavour is made to keep stock off when the weather is unsuitable.



Loading top soil

Fencing

By this stage, the field boundaries have been or are being replaced. These may be on the lines of original fences or hedges, but very often the opportunity is taken to form enclosures of a size and shape more suitable for modern requirements of the particular farm concerned. The majority of the restored fencing is of the post and wire type but on many sites hedges are planted so as to provide shelter for stock in due course. All the fences including the protective fencing for the hedges are erected by a N.C.B. contractor but the Divisional Land Commissioner is responsible for all the work in connection with the actual planting of the hedges. The establishment of a quick thorn hedge on an opencast coal site can be a problem if the roots are in ground that is waterlogged for long periods and, in an attempt to overcome this difficulty, two methods of planting are now used.



*Scraper used for top soil
and subsoil*

If it is possible to start work before the protective fencing is erected, the land is ploughed out away from and on each side of the line of the hedge. This is then gathered in and rotavated so as to leave a ridge upon which the quicks can be planted. There is the additional advantage of the plough furrows that are left on each side. Where planting has to be done after the fences have been put up, ploughing is not practicable and the second method is adopted. This consists of digging a trench about 5 inches deep and a spade width. The bottom of the trench is then loosened for a depth of about 5 inches and the plants are put in, the roots being firmly heeled in with a covering of soil. The trench is then backfilled, the soil being again firmly heeled around the plants. The quicks are spaced at five plants to the yard and superphosphate is given at time of planting at the rate of 3 oz per yard run.

Water supply and drainage

Water supplies to fields are replaced by the N.C.B. contractor so far as such supplies existed at the time the site was taken by the Board. This replacement may be inadequate because of a change in husbandry following reinstatement; in such cases additional supplies will be provided if the Divisional Land Commissioner considers them to be essential for the agricultural restoration of the land.

When the boundaries of the new enclosures have been established, the comprehensive tile drainage system is installed. The proposed layout is prepared by the Ministry's drainage officer and submitted to the owner for his approval before the work is put in hand. Subsoiling operations are done immediately after the drains have been laid and the trenches filled in. Again this plays an important part in speeding up the natural drainage of the land. On a restored site, summer is the ideal time for drainage work as, apart from minimizing the damage to the soil, it does enable the land to be ploughed and left over the winter before the reseeding in the following year.

Second seeding

Permanent mixtures used for the second seeding include either cocksfoot, ryegrass and timothy or cocksfoot, timothy and meadow fescue, the fertilizer

application being similar to that used for the original seeding. Basic slag at the equivalent rate of 7 cwt 14 per cent P_2O_5 is applied in the autumn followed by a spring top-dressing of compound fertilizer at the rate of 4 cwt per acre. This usually completes the five-year period of agricultural treatment of the soil by the Ministry.

Trees and buildings

Hedges have now been planted on restored sites for many years but more recently the provision of shelter-belts has become customary especially on sites exposed to the unkindly winds that occasionally blow in Northumberland! Up to the present, owners, by arrangement with the N.C.B., have accepted responsibility for the planting of these belts and very often this work has proceeded before much, if any, agricultural treatment has been given to the restored soils. Because of the risk of damage by tree roots, tile drainage cannot be installed under the site of a shelter-belt, but experience so far indicates that some cultivations including subsoiling should be done before the young trees are planted to help with drainage and soil structure.

New shelter-belts take time to establish but within the past few years a new technique has been developed which is now enabling the Board to transplant grown trees on to restored and working sites. The transplanting done so far in this county has been limited to small areas so as to provide windbreaks as well as improve the general appearance of the restored site.

Other work that occasionally arises on the large sites is the erection of new farmhouses, cottages and buildings to replace those demolished by the opencast operations.

Final stage

Good restoration is a matter of teamwork, requiring the co-operation and the active interest of all the parties involved, whether it be the Board and their coaling contractors, the Ministry and their contractors or the officers of these departments who are concerned with the day-to-day work on a site. While these joint efforts can make the land reasonably fit for agriculture, the ultimate success depends upon careful management after the land is released by the N.C.B. The fifth and final stage of the restoration, therefore, rests with the farmer, with the assistance of his District Agricultural Adviser, if required.

L. E. Collinson, F.L.A.S., is a Senior Assistant Land Commissioner at the Northumberland Divisional Office of the Ministry.

4. Breconshire

Hill farming—some of the men and their thoughts

W. G. Owen

WITHIN two miles of each other as the crow flies, live two outstanding personalities who have been deeply involved in the practice and politics of hill farming throughout their lives. Their views on the present situation and future outlook are enlightening.

The men and their farms

Mr. J. E. Lewis, who has been farming all his life, moved to Forest Lodge, Libanus, in 1943. Only some six years previously Mr. Ken Jones had taken over the family farm at Blaencamlais after an academic start at Oxford, followed by some teaching. They are both substantial farmers and public-spirited men who have given a great deal to the farming community.

Their two farms are rather different, with Forest Lodge having quite an exceptional layout for a hill farm. The layout is in large fields in almost geometrical pattern, amounting to 500 acres of cultivable land. It also has 1,000 acres of enclosed hill in contrast to Blaencamlais which has hill rights on Mynydd Illtyd Common. Blaencamlais has, in addition, 250 acres of ploughable land.

Present policy

Both farms have two flocks of sheep, one especially adapted to utilize the hill grazings and the other to utilize to better effect the enclosed fields or cultivable land. The ewes on the enclosed fields are, in the main, draft hill ewes and are put to a Border Leicester or Suffolk tup for producing the Welsh Halfbred ewe lamb or a fat lamb respectively. All hill wether lambs are fattened on the low ground on both farms.

The cattle policy on the two farms differ in that Forest Lodge has a predominantly Hereford suckler herd which is mainly spring calving, whilst

Mr. K. W. T. Jones with some Welsh Halfbred yearlings. Pen y Fan (2,906 ft), the highest point in South Wales, is in the background



at Blaencamlais the herd is almost equally divided between Welsh Blacks and Herefords. Here a calving policy orientated towards the autumn is being adopted.

Winter feed is conserved as silage and hay at Forest Lodge and as barn-dried hay at Blaencamlais. The two farms have a certain reserve stocking capacity which enables both farmers to bring their lambs forward in good condition by the autumn. They also have sufficient buildings to overwinter some cattle in the event of a poor autumn trade. Shelter-belts and a small sale of timber products are a feature of both farms.

Looking to the future

Both men are concerned about the true hill farmer with no in-bye land where the conditions and opportunities are even more limited than on their own farms. Mr. J. E. Lewis in particular has been closely associated with the wool trade for several years. He expresses great concern about the present state of affairs where man-made fibres are commanding an increasing share of the total market. The inflow of income to the hill farm is limited to the period between August and November and any substantial reduction in the wool cheque could be quite serious for some farmers.

Mr. J. E. Lewis and Mr. Ken Jones feel that there is no long-term answer for the true hill farmer apart from some form of co-operation or integration with the lowland farmer. This adoption of the old Hafod and Hendre system was thought to be of considerable importance, as there are possibly no psychological barriers to the moving of whole flocks of sheep or herds of cattle to a lowland farm for the winter. A great weakness at present is the lack of cheap transportation of stock and fodder. There is also a dearth of able stockmen on some lowland farms.

Large livestock farming in the form of cattle and sheep would continue to be the main backbone of hill farming. It seems that a major problem will be to keep people living in the hills and to prevent a complete social breakdown together with all its implications. The presence of men and labour on hill farms is thought to be paramount to the continued existence of successful hill farming. The growth of contract labour in the form of gangs is viewed with certain approval but also with reservations as to the tasks which they could perform.

Another key issue which figures prominently in discussion on hill farming is winter housing of sheep and here, it was thought, lies room for more trial work and careful assessment.

Non-farming activities

A catalogue of all the positions and posts which both men hold in the farming and business world is unnecessary when we consider such concrete proof of their activities as the successful Welsh Halfbred Sale at Builth and the Brecon and Radnor Suckled Calf Association. Mr. Ken Jones is a founder member of the first-mentioned and together with Mr. J. E. Lewis and others, he has been involved in building up the latter to its present status.

Both Forest Lodge and Blaencamlais are inundated with visitors from far afield. Mr. Ken Jones and Mr. Lewis have a great tenacity for hard work at home when there is respite from the calls of duty outside.

The author wishes to acknowledge the assistance given by Mr. A. W. Prowel, C.A.A. for Brecon, Mr. J. E. Lewis, Forest Lodge, and Mr. K. W. T. Jones from Blaencamlais in the preparation of this article.

Buildings for the Single-suckler Herd

N. B. Wood *Agricultural Land Service, Bristol*

IN the early spring of 1966 it was decided that the Liscombe Experimental Husbandry Farm should devote more attention to the problems of single-suckling beef cows.

Initially, the main interest was in rates of stocking in relation to nitrogenous manuring, at the densities envisaged to be necessary to house the cows in winter. The Agricultural Land Service was asked to provide a building for cows and calves with facilities for rationed feeding.

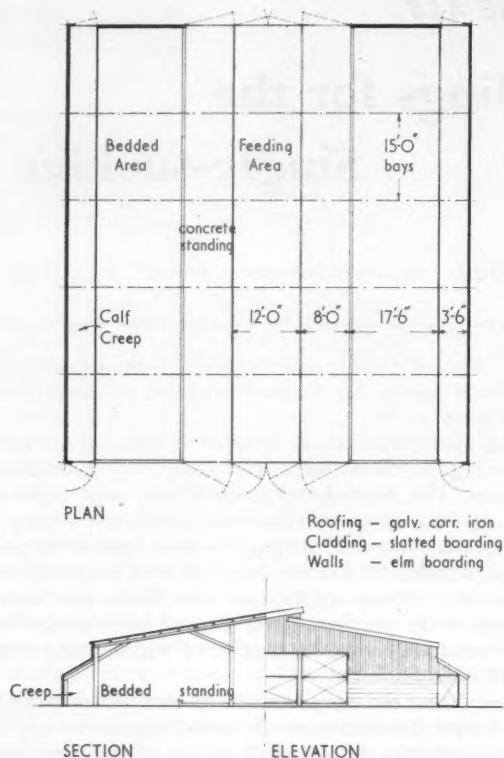
In designing the proposed building attention had to be paid to the fact that Liscombe is within the Exmoor National Park and that it was, therefore, essential that the external appearance was fitting and appropriate. The exposed nature of the site necessitated that all work should be under cover and that the structure should be capable of withstanding winds of a force upwards of 60 miles per hour.

It was decided that the design should be such that it could be copied by local farmers with the minimum of skilled assistance, and that the cost should be appropriate to the low profit margin of single suckling.

With these requirements in mind designing commenced. First thoughts were towards a lightweight structure incorporating cubicles. Early investigation along these lines showed that when facilities for controlled feeding under cover were provided there was no saving in space standards, and that the interior would be too specialized for flexibility in experimental work, particularly in the grouping of cattle. Cubicles were, therefore, abandoned in favour of loose housing. This is not to say, however, that cubicles have no place for suckler cows in other circumstances.

Second thoughts were for a pole structure with single slope roofs and quotations for materials, with poles of suitable sizes from local woodland owners, were sought. Two quotations were received for round poles to specified diameters. These were within shillings of each other. The third tenderer, however, said that he could supply sawn, home-grown timber cheaper than equivalent poles. As a result fresh tenders were then sought for both round and sawn timber, both pressure preserved, and the lowest tender was for sawn timber. A salutary lesson in the need to shop around and to find the cheapest market at the time of buying! Incidentally, it was discovered that sawn imported softwood could be purchased more cheaply than home-grown timber.

Having found an economic supply of timber it was essential, before proceeding further, to find a source of labour capable of fabricating a structure. In the absence of this it was obvious that it would be a waste of



time proceeding on these lines and that an off-the-peg pre-fabricated structure would be preferable. Again, three possible sources of labour were found and hourly rates of pay obtained for fabrication and erection and these were reduced to lump sum quotations after the design had been finalized. A rough check of costings at this stage gave encouragement that a building on the lines proposed could meet the requirements specified.

A design was prepared using sawn timber of two sizes only to reduce site handling and sorting. This design followed the original sketches of single slope roofs not meeting at the apex, in which the need for cutting to precise limits of all timber was reduced. The basis of the structure was twin planks with packing pieces formed by off-cuts and the braces.

The braces were taken through to form the calf creeps. Although this restricted the width of creep to 3 ft, it avoided extra fabrication and enabled ventilation to be over the top of the calf creeps and not through them. The feed passage was made wide enough to form a week-end store.

Competitive tenders were obtained for the roofing materials and for the electrical and plumbing work which were outside of the skills of the directly employed labour.

Site fabrication commenced in the late summer of 1966 and the building came into use during the following winter. The final costings may be of interest. Being on Exmoor there was a bulldozing charge of over £500 to

provide a reasonably level site. The gross cost of the building of 5,250 sq. ft was £1,964, i.e., 7s. 6d. a sq. ft; this figure would be reduced where grant could be obtained. Breaking this gross figure down further the cost per cow was about £17 and £3 10s. per calf after grant.

The building has created great interest locally and the Duchy of Cornwall Woodlands have decided to market the building in a pre-fabricated form. It has at least shown that with forethought and enterprise it is possible to erect comparatively low cost buildings of not unreasonable appearance.

in brief

- Farmer co-operation
 - Marek's disease
 - Healthy pigs
-

Stimulus to farmer co-operation

IT WAS a happy chance that saw the introduction of the new Agriculture Act in the year of the centenary of farming co-operation; for one of the measures in this far-sighted piece of legislation is the stimulation of self-help. The history of agricultural co-operation in Britain has been anything but a smooth, swift ascent to its present commercial importance. British farmers, unlike their opposite numbers in some parts of Northern Europe, have been slow to see the benefits that can accrue from well-organized co-operative action, whether in buying or selling. The last five or six years have, however, seen notable successes attending the strenuous efforts which have been put into the establishment and operation of marketing groups; and the proliferation of machinery syndicates (now over 1,000) speaks for itself.

In this climate of farmer receptiveness the present encouragement injected by the new Act for farmers to link together in production groups comes appositely. Farmers whose holdings are too small to be commercially profitable going it alone may well see in it an attractive alternative to full-scale amalgamation. Nor does this project need to apply to small farmers only; indeed with greater resources shared, capital investment becomes both more possible and more rewarding.

The Government-sponsored Central Council for Agricultural and Horticultural Co-operation has been set up, with Mr. Roger Falk, O.B.E. as its Chairman, to promote and develop co-operation between producers and to administer a scheme of grants for production and marketing projects. The scheme will come into effect this autumn and will apply throughout Britain.

H.R.H. the Duke of Edinburgh, speaking at the annual luncheon of the Agricultural Co-operative Association, claimed the co-operative idea to be the key to a greater agricultural prosperity. It is, said Prince Philip, not only a technical convenience to the farmer, but it acts as a deterrent to the destruction of the social structure of the community. 'It has been instrumental in bringing agriculture from a level of subsistence to its present standard of modern efficiency.'

The incentive to co-operate has never been stronger than it is today. Through the existing co-operative organizations and new ventures which we can expect to see springing up, the opportunity matches the moment.

Marek's disease; break-through

Poultrymen have taken some hard knocks from Marek's disease over the past few years, particularly since an acute form of the disease appeared in this country. The loss to the industry from this and leucosis is estimated to be running at not less than £10 million a year. The Houghton Poultry Research Station has been investigating Marek's disease and associated pathological conditions since 1961, and now that after six years of patient and complicated research the causal virus has been identified, the results for breeders and producers could be far-reaching.

The disease (also known as fowl paralysis, neuro-lymphomatosis and acute leucosis) which was first described in 1907, produces a tumour-like proliferation of lymphoid cells (a type of white blood cell) in the nerves and other organs. 'It is because the pathology of Marek's disease and lymphoid leucosis (another common lymphoid tumour disease of chickens) is similar in many ways, that the two diseases have been confused', said Dr. P. M. Biggs, Senior Principal Officer in charge of the leucosis experimental unit at Houghton. 'The first step towards an understanding of the cause of Marek's disease was our work at Houghton which positively demonstrated that it was an infectious and contagious disease due to an agent unrelated to the viruses which cause lymphoid leucosis. At the same time it was shown that there were features of the pathology of the disease which could be used to distinguish it from lymphoid leucosis.'

Genetic constitution greatly influences a bird's susceptibility to Marek's disease, and methods have been developed which could assist in the selective breeding of chickens relatively resistant to it. But before other methods of control and prevention could be developed by the research workers, greater knowledge of the causal agent of the disease was required. For this reason recent research at Houghton has largely been concentrated on studies designed to pinpoint the cause of this disease.

'It was soon clear', said Dr. Biggs, 'that we were dealing with an unusual agent. We had established that Marek's disease was due to an infectious and contagious agent, but at the same time our experiments showed that material to be infectious must contain living cells. This close association of the infectious agent with living cells suggested a number of possibilities for the nature of the causal agent. One of these was that it was a virus belonging to the herpesvirus group.'

'The difficulties encountered in working with the causal virus of Marek's disease may account for the lack of success of earlier research workers. The discovery of the nature of the causal agent and a method of handling it in the laboratory is vitally important to future studies of Marek's disease and will enable a more rapid development of methods to prevent and control the disease.'

Planning for healthy pigs

For years the pig industry has been wrestling with a host of ailments which, although they may not individually be of major importance, in total they have caused serious economic wastage. Bacterial build-up in pig houses, unsatisfactory ventilation, overcrowding and ineffective disinfection are all factors which underlie unthriftiness in pigs of all ages and point accusingly at mismanagement.

The Pig Health Scheme, which comes into operation on 1st November, is aimed at getting the full potential from genetic improvement and, by making breeding stock available from herds of known good health, raise profitability and stimulate our export trade.

Membership of this scheme will be restricted to owners of herds that have been accepted or are being tested for acceptance into the PIDA Accreditation Scheme, to owners of herds who provide control animals to the PIDA testing stations, and to owners who obtain a Ministry permit to import certain foreign breeds of pigs; such importation is conditional upon the progeny of the boars being submitted to PIDA for independent testing and report. Where an owner has other pigs in addition to

his accredited breeding herd on the same premises, all the pigs must conform to the health standards of the scheme.

Regular veterinary advisory visits at the Ministry's expense will be made at intervals of not more than three months, and all herd owners will have to keep records relating to the health of the herd, besides observing restrictions imposed when disease occurs and other rules concerning the movement of stock, disinfection of transport, etc.

Details of the scheme are available at all Animal Health offices of the Ministry.

Agric.

The Ministry's Publications

Since the list published in the September, 1967, issue of *Agriculture* (p. 458) the following publications have been issued:

MAJOR PUBLICATIONS

Experimental Husbandry No. 15. August, 1967 (New) 8s. (by post 8s. 7d.)

Report on Safety, Health, Welfare and Wages in Agriculture October, 1965, to September, 1966 2s. 3d. (by post 2s. 6d.)

MECHANIZATION LEAFLET

No. 15. Fertilizer Handling and Broadcasting (New) 1s. (by post 1s. 3d.)

FREE ISSUES

ADVISORY LEAFLETS

- No. 19. Pasteurellosis (Fowl Cholera) (Revised)
- No. 68. Carrot Fly (Revised)
- No. 85. Onion Downy Mildew (Revised)
- No. 109. Flea Beetles (Revised)
- No. 218. Dry Rot of Potatoes (Revised)
- No. 246. Silver Leaf Diseases of Fruit Trees (Revised)
- No. 266. Clover Rot (Revised)
- No. 271. Potato and Tomato Blight (Revised)
- No. 286. Chrysanthemum Midge (Revised)
- No. 341. Artificial Incubation in Small Incubators (Revised)
- No. 383. Cockroaches (Revised)
- No. 547. Strangles of Sugar Beet and Mangels (New)

SHORT TERM LEAFLETS

- No. 33. High Moisture Grain Storage (Revised)
- No. 41. Diseases of Chrysanthemums and their Control (New)
- No. 42. Grain Chilling (Revised)
- No. 47. Business Records—Office organization for Farms and Horticultural Businesses (Revised)
- No. 67. Farm Waste Disposal (New)

UNNUMBERED LEAFLET

Grants for Field Drainage (Revised)

The priced publications are obtainable from Government Bookshops (addresses on p. 506) or through any bookseller. Unpriced items are obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

Books

Arid Lands. Edited by E. S. HILLS. Methuen, 1966. 75s.

In 1951 UNESCO launched an Arid Zone Programme, its object being to promote and stimulate research in many scientific disciplines with the ultimate aim of improving the living conditions in desert and semi-desert regions. The programme of study became a major project in 1957 and was completed in 1962. This book reports on the research undertaken and also gives a comprehensive picture of life in arid lands. It is written primarily for advanced geography classes, but anyone with an interest in natural history, anthropology or the problems of living in desert conditions would find several sections worth reading.

Seventeen authors from eight countries have collaborated, each an authority on a particular subject. The book has twenty chapters each covering a separate topic. Full references to research papers quoted are given at the end of each chapter. There is no general index.

The arid zone is an area that is judged to be too dry to allow successful crops to be grown in average years. Obviously the boundary is not sharp and distribution of rainfall during the year(s) is also important. When rain falls, the risk of flooding is often present. The main arid zones are in North Africa, East Africa, South Africa, the Middle East, Central Australia, with large areas in both North and South America and Central Asia. The arid zones cover over one-third of the land area of the globe, but it is pointed out that the whole world has a stake in the potential productivity and uses of arid and semi-arid lands in view of rapidly-growing populations.

The topics covered are many and varied. There are interesting accounts of people in arid lands, how they make a living, the problems of growing crops and keeping livestock, the collection and use of water, the control of disease, the organization of social life and an important section for

those visiting arid lands—the rules for survival.

The geological structure of arid lands is discussed, together with an account of the action of rivers and streams and the work of the wind in forming landscape features, both past and present. This chapter is well illustrated with photographs. The section on soils deals with soil fertility, salinity and reclamation problems and the agricultural potential which must also be linked with the chapters on meteorology, water supply and management and irrigation. The natural life of the deserts forms a fascinating account; how both plants and animals have adaptations to survive desert conditions. In times of severe drought plants will survive as seeds or other dormant parts, but the many ways in which small desert mammals and reptiles are able to tolerate extremes of temperature and drought are remarkable. These chapters on plant and animal life are also well illustrated but in several photographs it would have been a help if a scale had been given, for example, are the animals on pp. 199, 200 and 208 one inch or one foot long?

The final chapter deals with research and the future of arid lands and looks at the possibilities and problems of solar power, desalination of water and modern methods of geophysical survey, and also the tantalizing possibilities of rain-making techniques.

On the whole a well-written book for the general reader and in a few sections only were less well-known scientific terms used.

T.B.

Insect Chemosterilants. Advances in Pest Control Research Vol. VII. ALEXEI B. BORKOVEC. John Wiley and Sons, 1967. 56s.

Since the advent of the contraceptive pill, popular imagination has been stimulated by the possibility of controlling all sorts of pest animals by inhibiting their reproductive potential. The appearance of the present title may indeed appear optimistic to agronomists seeking a panacea for all the ills of insect, and for that matter other animal, infestations. For many people the concept of reproductive inhibition depends on the mistaken belief that the population size of animals is regulated by the reproductive rate. Of course taken to extremes this is true because without progeny, populations must decay and perish. But, in practice, the number of young produced is vastly in excess of

replacement needs and the maintenance of population stability, hence a large surplus of young dies naturally through a variety of external agencies ranging from disease and predation to food shortage. There is a threshold which must be reached before the effects of a reduced fecundity become manifest. Further, because so many imponderables are involved, each species ought really to be considered on its own merits. It is disappointing that only a small amount of rather superficial discussion has been devoted to this important aspect.

There are two main ways in which sterility can be induced and its effects be manifested in a wild population. The first involves the release of large numbers of laboratory bred and sterilized males. In species where the female mates only once, irrespective of whether the mating is successful, the swamping action of these sterile males may significantly reduce fecundity. But in practice only a handful of species have been successfully controlled in this way including the classic example of the screw worm.

The second approach is to apply chemosterilants to the environment in such a way that the animals are rendered infertile *in situ*. It is the chemicals of potential value for this purpose that the author is chiefly concerned with in this book, especially alkylating agents and antimetabolites. He has listed every chemosterilant screened by the enormous American drug industry up to 1st April, 1966—an impressive task. In fact, the list together with references occupies the second half of the book. To back this up there is a chapter dealing with the chemistry and structure of the main groups of compounds with sterilitant properties, a chapter on their physiological effects—where known, and one devoted to their testing and practical application. However, most of these substances have not been critically tested for undesirable side-effects; without extremely stringent tests none would ever be passed for legal use in Britain. The difficulty is that these chemicals have to be used like insecticides and particularly dangerous ones at that. Not only may they poison the habitat but some could cause mutations in man and wildlife, apart from less drastic ills. We are nowadays fortunately very conscious of these potential hazards. Even so, this short review of a general situation and the emphasis on practical reality should not detract from the value of Dr. Borkovec's personal scholarship and the admirable and authoritative way in which he has covered a highly specialized subject.

R.K.M.

The High Yielding Dairy Cow. Series of Lectures by ROBERT BOUTFLOUR. Crosby Lockwood and Son, 1967. 21s. (Paperback 12s. 6d.)

For those farmers and students who attended one or more of Boutflour's talks or lectures, the appearance of some of his material in written form will pose the question, does he really come through in the text? For Boutflour was undoubtedly an inimitable teacher by word of mouth. A master of metaphor and of ridicule, he was quite capable of leaving an audience, however unsympathetic, hardly daring to do other than swallow the lesson, hook, line and sinker. A feature of his lectures was that in spite of his aggressive and often provocative attack, he was a very popular speaker. No doubt this was partly due to his witty, and sometimes lurid, illustrations, but it was also due to his insistence on driving home one point at a time and leaving no doubt about it. His favourite target was the man who did not think clearly, and for this reason alone a reproduction of his lectures would be justified.

Boutflour had a great influence on his students and also on dairy farmers generally. It is doubtful if his dicta about cattle breeding ever did, or ever will, have much impact. His suggestion that the quality of the cow was secondary to feeding and management was not widely accepted, and his support of dam-daughter comparisons in the assessment of bulls was shortly to be replaced by the more logical and more effective progeny testing on the basis of comparison of daughters with their contemporaries. On the other hand, there can be no doubt that his ideas on feeding are quoted and practised up to the present day. His advocacy of steaming-up, i.e., concentrate feeding before calving, of liberal use of concentrates during lactation, and his condemnation of roots and some of the other bulky feeds are referred to with respect by many dairy farmers, some of whom are too young to have known the man.

It has always been difficult to define the technical differences between feeding methods advocated by Boutflour and those of other advisers. There was always a tendency to cater for the individual cow, and this is well illustrated in the second of his lectures. Lack of definition did not, however, indicate lack of success, and in the first paragraph of lecture 9 the casual mention of the yields of three cows in the small Steadings herd at the Royal College of Agriculture was a powerful argument in favour of any system of feeding—'Crocus is doing 106 lb, Lofty 125 lb and Beauty 115 lb a day'.

The value of this book lies in its illustration of the possibility of obtaining very high yields with ordinary cows. Herds are becoming bigger and attention to individual cows smaller since Boutflour lectured to his students. But capital investment in dairying is also rising. The ideas which these lectures present give hope to the young man with little capital but with intelligence and energy, who wishes to make a start in milk production.

The answer to the original question is that there is no substitute for Bobby Boutflour in person, and these lectures cannot be taken as a text-book on milk production. But as a reminder of a great personality, and as a challenge and stimulant to those who wish to make a success in dairy farming, it will undoubtedly serve a very useful purpose.

A.S.F.

Farm Buildings. R. B. SAYCE. The Estates Gazette, 1967. 75s.

'Can I borrow your Sayce?' will undoubtedly be the plea of the indigent student of estate management, trying desperately to maintain a wife and three on his state grant, to the opulent son of the squire learning to 'manage own property'. Sayce on Farm Buildings must become the accepted students text-book though its price may make young men think twice before they buy it. Their decision will rest on its capacity to fill the role in later life as a reference book for their office table.

The author recognizes that the difficulty he faces is the risk that a book on this subject may become outdated very quickly. He has cleverly overcome this to a large extent by adopting a layout for the book which isolates, as far as possible, in each chapter the section which is most at risk in this respect. This plan should make revision easier and will also give the reader who has an old edition the chance to refer to the regularly revised Fixed Equipment of the Farm leaflets produced by the Agricultural Land Service for up-to-date design recommendations. Sayce generously acknowledges his indebtedness to this series of leaflets and includes them in the bibliography which is a valuable feature of the book.

The approach to farm buildings on a basis of estate management is the only way a balanced view on this controversial topic can be obtained. It is not a matter upon which clear cut, single and obviously correct solutions can be obtained to each problem. There will normally be a variety of possible

and reasonable solutions. The choice can only be wisely made by one who understands something of building, agriculture, and a great deal about valuation. The author's experience enables him to set down the considerations to be taken into account and to lead the reader logically to sensible conclusions.

The layout of the book, especially its closing chapters on finance and specifications, and the appendices which summarize a wealth of detailed information, will endear it to the busy practitioner. The illustrations deserve a special mention. They are uncluttered and in the majority of cases are on the same page as the text which they serve to clarify. A simple point but one which is often overlooked.

Thus the second string to the bow of this text-book for students is quite well established. Its value will be considerable to those whose experience lies mainly in kindred subjects such as agriculture and architecture but will not be negligible even to those who are well up to date as estate managers. The unrivalled opportunity to gain experience in the sphere of farm buildings which is given to officers of the Agricultural Land Service has been well employed for the benefit of a far wider circle. The book is sound value for money—in fact a 'Best Buy'.

J.D.F.

Goat Husbandry. DAVID MACKENZIE. Faber and Faber, 1967. 63s.

This new edition of *Goat Husbandry* contains a great deal of information on all aspects of goat-keeping. The author traces the history of the goat in Britain through two great wars and the encouragement which was given by the Ministry's Stud Goat Scheme.

However, when austerity and rationing came to an end and the demand for goats' milk was replaced by ample cows' milk, the average yield fell by 14 per cent and 12 per cent in butterfats. At the present time the yields are now some 20 per cent below the 1948-49 peak. In the writer's opinion this has been partly due to the smaller demand for goats' milk and the drop in profitability. The breeders that have remained in being have found more profit from animals with a good show record rather than a high yield. Mr. Mackenzie also feels that a 2½ lb per gallon of starch equivalent, as recommended for cows, is inadequate for the goat and this should be raised to 3 lb. He describes some recent work done by the Robert Ford Laboratory in the U.S.A. in

deodorizing male goats. As this can be done when the horned kids are disbudded, much objection to the breeding of male goats would be removed.

In this edition the author has omitted the chapter by Dr. J. B. Tracey on the use of goats' milk in medical practice, but has included a very informative chapter on the nutritive and curative value of goats' milk showing the value of its fat, lactose, nitrogen, minerals and vitamins.

For the goat-keeper who wishes to grow part of his own food there is a chapter on the production of oats, barley, beans and lucerne and also a Herbal Lea grazing mixture. He also suggests that goats can make use of industrial waste not suitable for cattle or pigs where there is a high fibre content.

This is a book every goat-keeper should have, not only for the very wide theory and scientific knowledge it contains, but also for the many practical hints which twenty years' personal experience of goat-keeping have given the writer.

M.B.S.

An Agricultural Geography of Great Britain. D. W. GILCHRIST SHIRLAW. Pergamon Press, 1966. (cloth cover) 17s. 6d. (hard cover) 25s.

This book should be read by all students embarking upon a course in agriculture. It contains much useful factual information concerning British agriculture, as well as describing the major farming systems and their geographical distribution. The author lectures at Durham School of Agriculture, so that the approach and emphasis is agricultural rather than geographical, although the book is published in the Geography Division of Pergamon's Commonwealth and International Library Series.

The first section describes the factors determining choice and distribution of farming systems. Section two outlines the major farming systems. The chapter on dairy farming, for example, discusses breeds, housing and feeding systems and the possible monetary returns: in other chapters alternate husbandry and rotations and intensive arable farming are briefly, but adequately, discussed. The basic information adds greatly to the value of the book for agricultural students. The third and fourth sections describe the geographical distribution of farming systems in Scotland and in England and Wales respectively. The geology, soils and climate of each region are outlined,

together with the main features of the region's agriculture. A glossary defines the more technical terms.

On the whole, the text is well balanced, although a fuller discussion of certain topics, e.g., forestry, could have been included. It is easy to read, but some of the sketch maps are rather confusing: the choice of symbols is puzzling, and it is not always obvious which is sea and which is land. Climatic data would probably be more easily assimilated by the majority of readers if presented in the form of histograms (for rainfall) and graphs (for temperature), rather than in tabular form. These are minor criticisms, however, and detract little from the value of the book. Those concerned with teaching agriculture, at all levels, will find it most useful. It should provide geographers with a greater insight into British agriculture than many of them currently possess, while the general reader will learn much about the current agricultural scene.

J.L.H.

Books Received

Department of Hop Research Annual Report 1966. (From 1st April, 1966 to 31st March, 1967). Copies from the Secretary, Wye College, nr. Ashford, Kent. 6s.

Eley Game Advisory Station Annual Review 1966-67. Copies free from the Station, Fordingbridge, Hampshire.

Trends and Possibilities in Modern Livestock Husbandry. (The Share-Jones Lecture). W. E. Jones. University of Wales Press, 1967. 3s. 6d.

The Economist and Farm People in a Rapidly Changing World. (International Journal of Agrarian Affairs. Vol. V, No. 2, May, 1967). Oxford University Press, 10s. 6d.

Farm Planning Data 1967. J. G. Davidson. Copies from the Farm Economics Branch, School of Agriculture, Cambridge. 5s. (including postage).

Aid in Uganda—Agriculture. Hal Mettrick. Overseas Development Institute. Copies from Research Publications, 18 Victoria Park Square, Bethnal Green, E.2. 20s. (by post 20s. 9d.—overseas 21s.).



Agricultural Chemicals Approval Scheme

Since the publication of the 1967 List, the following products have been approved:

INSECTICIDES

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Fumite Azobenzene Cones—Pains-Wessex

PARATHION

Liquid Formulations

Murphy Parathion 20—Murphy

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MERCURY-ORGANOMERCURY COMPOUNDS

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Liquid Dressings

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METHAM-SODIUM

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Company Information

CHANGE OF ADDRESS

Amoco (U.K.) Ltd., (Agricultural Chemicals Division),

International Life House,

Olympic Way,

Wembley, Middlesex. (01-902 8820)

Ciba Agrochemicals Ltd.,

Technical Department,

Duxford, Cambridge. (Sawston 3141)

Hoechst Chemicals Ltd.,

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CORRECTION

In the July, 1967, issue of *Agriculture* the product Karmex was incorrectly assigned to the firm Du Pont, this should have read **Borax Consolidated**.

ACKNOWLEDGEMENT OF PHOTOGRAPHS

We gratefully acknowledge permission to use the following photographs:

Front cover Imperial Chemical Industries Ltd. P. 459 *Farmer's Weekly* photograph by Gordon Cradock. P. 462 G. M. Jones. P. 465 Dr. E. S. Bunting. P. 469 University of Oxford. Pp. 472 and 473 The British Association for the Advancement of Science. Pp. 480 and 483 Government of the Netherlands. Pp. 490, 492 and 493 L. E. Collison.

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